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ANALYSIS OF SINO-INDIAN TRADE AND TOURISM AS THE BASE FOR THE REVIVAL OF THEIR PARTNERSHIP

India and China are among the fastest growing emerging market economies; and have experienced rapid rise in trade and tourism in recent years. This guided the choice of the two countries for in-depth analysis.

This is a rare study which empirically explores the association of tourism, with trade, and GNP. Tourism has multi-dimensional ramifications relating to dissemination of innovation, technology, organization, and managerial techniques. These in turn promote productivity and propel growth in countries.

The paper examines the association between Sino-Indian trade and Sino-Indian tourism and the association between Indian trade and Indian tourism with the world. The following methods have been used to examine the above association: Summary statistics, innovative form of t-statistics to determine significance of difference between sample mean and median, econometric models comprising Dicky-Fuller tests and regression. Thus, the study uses Karl Popper dictum that «No theory can pass muster as finally acceptable without repeated testing with different data sets so data relating to Indian tourism and its trade relation with China and the world are used. Detailed theoretical background for specifying the relationship between the core variables has been used. The empirical analysis finds Outbound/Inbound Sino-Indian tourism to be a direct function of Sino-Indian trade while trade emerges as a function of GNP. The ratio of Sino-Indian tourism to India's world tourism has also been found to be a positive function of the ratio of Sino-Indian trade to India's world trade. Besides Indian world tourism is also a positive function of India's world trade. Therefore, both Sino India trade and India's world trade along with tourism has great potential for future growth. The study covers a period of 19 years from 2000-01 to 2018-19.

Key words: Indo-Chinese, tourism, trade, GNP, RWM, econometric-modeling.

Introduction

China and India have a long history of Trade, Tourism, and cooperation, despite the mighty Himalayas dividing the two giants. Ashok Maurya the great Indian King sent scholars, preachers, and teachers across Asia to spread Buddhism. Subsequently many Chinese scholars and travelers visited the ancient Indian universities such as Nalanda, Taxila and other Buddhist centers to study Buddhism. Gradually religious-cultural exchanges were complimented by trade relations through silk route. Eventually silk route trade gave way to full commercial and business relations (Mohan Malik, 2011), through sea-routes. There are references of these in the Song (960-1278), Yuan (1279-1368), and the early Ming dynasty (1368-1644) periods. Besides, India and China were the two most developed economies of the world till the Middle Ages which prompted Marx to eulogize Asian mode of production. Prakash, S. (2003).

India exported coral, pearls, glass, and fragrances to China, while China exported silk products to India. This exchange was not just confined to commodities, music and dance, culture and manufacturing technology also made their way to China from south Asia. Historically peace and stability along the Silk Road, have been an important contributor to trade and prosperity.

The economic and cultural exchanges along with the great migrations caused an emergence of a complementing culture along the Silk Road. This culture covers a vast area from East Turkistan (China) to today's Turkey in the West and to India in the South. This entire belt is a melting pot of cultures, countries, religions, ethnicities, and socio-political structures. This could be the catalyst in the emergence of the Silk Road as an important sub-global economic region given its population of more than one and a half billion with median age of approximately 24 years a critical factor in economic development of any region (Rani, S., & Tuteja, G. (2015))

Sino-Indian cooperation extended into the political arena when Indian and Chinese revolutionaries joined hands with each other against the imperialist

powers like East India Company (1857-59) and the Manchu-led Qing dynasty (1644-1912) as well as the Japanese invaders in 1930's, Indurthy.,R. (2016).

Silk route trade between India and China symbolized the contribution of peaceful cooperation and collaboration for prosperity in India and China. Trade is postulated as an engine of economic growth Marshal, (1892). Trade may be interpreted in a wider sense to include softer items like language, literature, philosophy, culture, traditional modes of health and education besides commodities and finance. Effect of trade on softer items goes far beyond economic gains and has lasting effect on people and governments. Like trade, tourism also promotes growth through its has multiple forms and purposes such as religious tourism, health tourism, education tourism, entertainment and holidays, and commercial tourism. The Silk Road symbolizes a complimentary identity by the fusion of cultures from the Yellow River Valley to the Mediterranean Sea (Behera.S. 2002). A study by Mcdermott and Mornah (2015) found culture as an important determinant of international business and a significant factor to explain the pattern of international business and the decisions to trade and invest. The above background has prompted the authors to select this topic for empirical research.

Objective of the Study

The focus of the study is to establish a link between trade and tourism which envelops implicitly services and culture.

1. To determine the current status of Sino-Indian Trade.

2. To determine the relation between tourists, exchange and trade between China and India;

3. To estimate the linkage between trade and income between India and China.

4. To determine a link between India's global tourism and global trade

Current Sino-Indian Trade

After a brief lull in trade relations India and China officially resumed trade in 1978. Sino-Indian bilateral trade, which was as low as US$1.8 bn in 1999-00, reached US$72.3 bn in 2014-15, making China India's largest merchandize trading partner. In 2014-15, India's exports to China were US$11.93 bn, whereas India's imports from China were US$ 60.43 bn, resulting in a trade deficit of US$48.5 bn for India. China accounts for 3.85% of India's global exports while it accounts for 13.48% of India's global imports. This trade imbalance needs correction for long term sustainability without going into payments problems or diversion of export earnings from other sources. The above statistics has further increased 2015-2019.

More than 45% of total Indian exports to China comprise primary goods like mineral fuels, cotton, copper, and rare earth while Indian imports comprise mainly nuclear appliances, chemicals, and electrical machinery from China (Panda, B. & Reddy, D., R., K. (2016). The top five export partners of India in 2019 were (USD B/Share percentage): 1. USA (54.29: Share 16.79%); 2. UAE (29.54: 9.14%); 3. China (17.28: 5.35%); 4. Hong Kong (11.48: 3.55%) and 5. Singapore (10.74: 3.32%), whereas top five import partners of India in the same year were 1. China (68.4: 14.28%); 2. USA (34.92: 7.29%); 3. UAE (30.31: 6.33%) 4. Saudi Arabia (27: 5.64%); 5. Iraq (22.1: 4.61%) (World Bank, 2019). Clearly the potential to make this trade grow is immense given the size and the growth rates of the two economies. However, the historical political legacy of the past remains an impediment to commerce.

A Study by (Rani,S & Tuteja, G., 2015) empirically found India's trade potential with China and other aggregated countries/blocks on the silk route. The trade intensity index was less than unity implying huge untapped potential of trade. They further found that trade among most countries on this route is underrepresented, as most have under 1 trade intensity (max being 1). The reason for future potential is accounted by the fact that India and China were closed economies till 1980s because of which trade was highly restricted but opening of both economies has thrown up huge opportunities for future growth. Technological advances have transformed non-tradable commodities and services like health, education, telecommunication, financial services and so on into tradable commodities. Therefore, there is huge scope for Sino-Indian trade to be diversified to include the above for mutual prosperity. It is further argued that this would provide impetus for cross border trade as envisaged in the «One road-one belt» (OBOR) concept.

Material and Methods

The study uses the following statistical methods of analysis:

a. Tools of Descriptive Statistics for assessment of current status of (i) economic development as measured by net national income, (ii) level of Indo-China trade comprising imports and exports, and (iii) Inbound and Outbound tourists to and from China to India, and the world (iv) nature and pattern of intertemporal distribution of the values of the above variables; and

b. As the study uses time series data, three versions of Random Walk Model (RWM) in conjunction with Dickey-Fuller test of stationarity are used. Following three are the versions of Random Walk Models:

RWM without Drift

$$\Delta Y_t = \delta Y_{t-1} + u_t$$

RWM with Drift (Constant)

$$\Delta Y_t = \beta_0 + \delta Y_{t-1} + u_t$$

RWM with Drift and Stochastic trend

$$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + u_t$$

Where $\Delta Y_t = Y_t - Y_{t-1}$ is the first order difference of Y_t, β_0 is the coefficient of drift, $\delta = 1 + \rho$, where ρ is the root of the equation and t is time. If $\rho < 1$ and statistically significant, equation is out of unit root circle; regression estimate of the equation will yield genuine rather than pseudo results. This requires δ to be negative and statistically significant, that is, $\delta < 0$. If this condition is not satisfied, then the time series is non-stationary, and it is likely to yield spurious results.

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The study uses linear regression functions for estimating relations between dependent and independent variables involved in the system.

c. Sources of Data: The paper covers a period of 19 years from 2000-01 to 2018-19

1. World Bank and IMF,
2. Economic Survey of India and Ministry of Commerce, Govt. of India
3. China's Government Data
4. India tourism statistics

d. Policy Implications

1. For Government trade policy
2. For Tourism
3. For Businesses

The Analysis of Empirical Results is reported in the Appendix in Tables 1 and 2.

Results and Discussion

As a preliminary step of data analysis, results of descriptive statistics comprising are mean, standard error of mean s, median, standard deviation S, variance s^2, and coefficients of skewness and kurtosis, minimum and maximum values are analyzed. These results reflect the nature of distribution of the values of a given variable. Most of the tests of statistical analysis assume that the values of the variables are normally distributed. Therefore, tools of inferential statistics are not distribution free; results of summary statistics facilitate the evaluation of the assumption that the values of the variable are normally distributed. The assumption is tested by t statistics of the significance of the difference between the values of mean and median such as:

$$t = \frac{\overline{|Mean - Median|}}{s/\sqrt{n-2}}$$

Results of summary statistics reflect the status of income, tourism, and trade. If the distribution is not normal it is likely to be skewed and high values are likely to be concentrated around a narrow space near mode. This may also suggest the time series may not be stationary.

The study uses the above modified t test to evaluate whether the difference between mean and median differs significantly on the assumption that mean, median and mode coincide at the midpoint of the normal distribution. This may however be verified by RWM. As the t statistics has low power and small sample spread relative to RWM the stationarity of the distribution is tested by Dickey-Fuller test also. The coefficients of skewness and kurtosis highlight whether the distribution is normal or divergent from normal. Skewed distribution is likely to be non-stationary. Stationary time series is characterized by constancy of its mean and variance, while covariance is not affected by the point at which it is calculated. This paper also assesses stationarity by RWM.

The following table contains the t statistics of exports to China, Imports from China, Total Trade with China, Departures from India, Arrivals in India and Total Tourists (India-China).

Table 1 – Descriptive statistics of Indo-China trade and tourism.

Variables	t-statistics
Exports to China	-0.1386
Imports from China	0.6562
Total Trade with China	0.4275
Departures from India	-0.3681
Arrivals in India	0.5754
Total Tourists (India-China)	-0.0783
GNP of India	0.51

t-statistic's has been developed for small samples 30 or less than 30 observations to test the significance of the difference between sample and population means or means of two independent samples from the same or different populations. However, this study has used an innovation for use of t-test. It is assumed that the distribution under consideration is normal and hence mean and median are equal. This is treated as null hypothesis so the following formula of t-statistics is used ((Mean-Median)*Sqrt (N-2))/ SD. The calculated values of t-statistics of the time-series data are reported in the table 1. The values of t range from minimum -0.3681 to maximum value 0.6562. Besides the t statistics of GNP of India has a value of 0.51 which is statistically non-significant at 0.05 probability. As all these values are less than the Critical value 1.96, the difference between means and medians of these variables are not significantly different. The table shows that the calculated values of t-statistics are less than the table value for 0.05 probability level. This suggests that the null hypothesis of equality of mean and median of above variables is not rejected on this evidence. It may suggest that as the sample size increases the distribution maybe predicted to converge towards normal distribution on the basis of Central Limit theorem. However, the power and sample size limitations of t distribution may not furnish conclusive evidence to conclude that the time-series data may be treated as stationary. So, the values of coefficients of skewness and Kurtosis and the results of Dickey-Fuller of Stationarity will be examined.

Table 2 – The following table contains the descriptive statistics of exports to China, Imports from China, Total Trade with China, Departures from India, Arrivals in India and Total Tourists (India-China).

Variables	Exports to China	Imports from China	Total Trade with China	Departures from India	Arrivals in India	Total Tourists	India's World Tourism	India's World Trade
Mean	578102.0666	2258611.0582	2836713.1248	0.5316	01319	0.6634	20.0749737	26984113
Standard Error	77067.5801	400461.7833	470831.5637	0.0456	0.0203	0.0654	2.29520674	4184539.9
Median	589394.1160	1980790.7580	2623942.1850	0.5493	0.1195	0.6689	18.77	22151910
Standard Deviation	335929.7935	1745572.4440	2052307.2057	0.1989	0.0885	0.2853	10.0045742	18239986
Sample Variance	112848826148.2390	3047023157158.8100	4211964866729.4500	0.0396	0.0078	0.0814	100.091506	3.327E+14
Kurtosis	-0.6886	-1.4819	-1.4175	-1.3504	-1.2570	-1.4108	-0.98664016	-1.517473
Skewness	0.1579	0.2268	0.1703	-0.1552	0.2130	-0.0784	0.4112	0.184129
Minimum	45400.3600	97119.2400	142519.6000	0.2089	0.0139	0.2228	7.1	4296630
Maximum	1176733.1480	4922361.6540	6093683.9240	0.8190	0.2820	1.0660	37.85	59024010

The above tables show that the value of average exports to China is only about 25% of imports from China. India has been having an adverse trade balance with China on an year-on-year basis and the mean value of total trade with China is 28367131 million. The mean number of Indian tourists arriving from China is only 24% of the total departures in India from China. Total India-China tourism is 0.66 million. The above mean values of trade and tourism imply there is great potential for future growth of Sino-Indian trade and Tourism in order to correct the balances.

On an average India's total tourism is 20.07 million persons. It means that Sino-Indian tourism is only 3.3% of India's world tourism. Mean value of India's world trade is INR 26984113.16 million. Indo-Chinese trade is 10.5% of India's world trade.

Calculated values of t-statistics of World Tourism and World Trade are 0.537 and 1.092. This evidence suggests that the null hypothesis under test that mean equals median cannot be rejected. Besides as the sample size increases, the distribution may converge towards normality as predicted by Central Limit Theorem. So, the time-series maybe on this basis expected to be stationary. However, the power of t-test is low, and its sample spread is small. Therefore, this test is not very powerful. So, the stationarity will be tested by Dickey-Fuller test. This is supported by the values of the coefficients of Skewness and Kurtosis. The coefficient of Skewness of World Trade 0.41 and World Trade is 0.18. Both these values are not statistically significant. Coefficients of Kurtosis of World Trade and World Trade are -0.98 and -1.51. Thus, the coefficients of Kurto-

sis and Skewness suggest that the distributions are neither skewed significantly nor are these concentrated in and around modal values. These results are in consonance with the results of t-statistics.

Discussion of Coefficients of Skewness & Kurtosis of the above core variables. exports to China, Imports from China, Total Trade with China, Arrivals in India, India's world trade and India's world tourism and the values range from 01.15 for exports to China to 0.41 for India's world tourism. Therefore, the distribution of these variables is neither positively nor negatively skewed and hence it may converge to normal distribution, These results are in consonance with the results furnished by t-statistics of these variables. But the coefficients of skewness of Departures from India and Total Tourists are negative, and the values are -0.07 and -0.15; these values are greater than -1. Hence the distribution of Departures from India and Total Tourists are negatively skewed and diverge from normal distribution. These two series maybe is non-stationary.

The coefficients of kurtosis of all the variables are negative but the coefficients of Arrivals in India and India's world Tourism. These variables are less than 1 hence the high values are concentrated in and around the narrow modal area. But the high values of all other six variables tend to be concentrated around the area around the mode. This suggests the distribution of these variables may also diverge from normal distribution. Thus, the coefficients of skewness and kurtosis taken together that the distributions may diverge from normal distribution which are dissonance from results of the results t statistics. As has already been pointed out power and sample of t statistics is low and sample spread is small. Thus, the above results are not surprising which suggests need for application of RWM to detect stationarity or non-stationarity of sample distribution.

Table 3 – Results of Summary statistics of GNP of India

$ GNP	
Mean	1527.536
Standard Error	174.953
Median	1505.735
Mode	# N/A
Standard Deviation	762.6024
Sample Variance	581562.4
Kurtosis	-1.12154
Skewness	0.187499
Range	2408.589
Minimum	485.4426
Maximum	2894.031
Sum	29023.18
Count	19
t-statistics	0.51214

The average GNP of India is USD 1527 Billion. The coefficient of skewness is positive but less then 1. So the distribution is not skewed. The negative coefficient of kurtosis is less than -1 which is also non-significant at 0.05 probability. The GNP ranges from a minimum of 485.4 B USD to a maximum of 2894 B USD. Thus, the variation of GNP between the years is quite high. This inference is also supported by a high value of variance.

Results of Random Walk Model and Dickey Fuller Test: Export, Import and GNP

i. Exports and imports from/to India

Table 4 contains the OLS estimates of RWM of Imports and Exports from/to India

Table 4 – RWM Summary of Exports and Imports from India

Random Walk		Statistical Value
Imports without constant (India)	$\widehat{\Delta imp_t} = 0.068 imp_{t-1}$ (1)	t = 1.61 R^2 = 0.189 F = 2.89
Imports with constant/drift (India)	$\widehat{\Delta imp_t} = 9800.01 - 0.157 imp_{t-1}$ (2)	t = 2.81 and -1.76 R^2 = 0.20 F = 2.10
Exports without Constant (India)	$\widehat{\Delta Exp_t} = -0.0050 Exp_{t-1}$ (3)	t = -0.07 R^2 = 0.00061 F = 0.0091
Exports with constant (India)	$\widehat{\Delta Exp_t} = 5821.05 - 0.39 Exp_{t-1}$ (4)	t =2.6 & -2.01 R^2 = 0.893 F = 3.95

The first two RWM equations without drift and with drift show the positive and negative coefficients of lagged imports to be statistically non-significant indicating the equation to be out of unit web. These inferences warrant assessment of validity of RWM with drift and stochastic trend. The equation shows that the coefficient of lagged imports emerges as negatively significant; So, the time series of imports may be taken to be non-stationary. Next stationarity of time series of exports of India to China is examined. The third equation depicts the equation to be out of unit root circle, as the negative coefficient of lagged exports is not significant. The coefficient of lagged exports is statistically significant. Besides the significant coefficient of time shows the existence of stochastic trend in the series of data. So, the series of exports and imports are non-stationary. Therefore 3rd version of the equation (with drift and stochastic trend) is unwarranted.

ii. GNP Random walk model

Table 5 – GNP Random Walk Model

Random Walk Model	Equation	Statistical Value
GNP without constant	$\widehat{\Delta GNP_t} = 0.1195 GNP_{t-1}$ (5)	t = 11.88 R^2 = 0.901 F = 133.42
GNP with constant	$\widehat{\Delta GNP_t} = 494799.81 + 0.0621 GNP_{t-1}$ (6)	t = 2.97 & 2.86 R^2 = 0.45 F = 7.77
GNP with drift & stochastic trend	$\widehat{\Delta GNP_t} = 1347893.15 + 298381.02t - 0.289 GNP_{t-1}$ (7)	t = 3.97, 2.83, -2.72 R^2 = 0.718 F = 9.99

The roots of the first two equations in Table 2 are statistically a bit greater than 1, indicating the time series of GNP to be non-stationary. Introduction of stochastic trend with drift in the function transforms the sign of the coefficient of lagged GNP from positive to negative which is statistically significant.

The above results have paved the way for the estimation of India's exports and imports as a function of GNP. A country's exports grow with its economy; growth of output throws up ever increasing exportable surplus. Imports have to be paid for out of export earnings which also arise from growth of GNP. Therefore, both exports and imports are treated as a positive function of GNP. Results of these functions are discussed below.

iii. Inter-relations between exports/imports and GNP

Table 6 – Inter-relations of exports and imports and GNP

Regression	Equation	Statistical Value
Imports as a function of GNP	$\widehat{Yimp_t} = 3035.4 + 0.0044 GNP_t$ (8)	t = 0.78 & 10.01 R^2 = 0.88 F = 83.78
Exports as a function of GNP	$\widehat{Yimp_t} = 9239.65 + 0.00022 GNP_t$ (9)	t = 3.93 & 1.89 R^2 = 0.97 F =2.67

Imports as a function of GNP fits the data well as 88% of total variation in imports over the years is explained by the function. The coefficient of correlation and regression are statistically significant. Corresponding to 1 billion USD increase in GNP imports increase by 4.4 million USD. The function of exports fits the data well the explained proportion of variation of exports is 97% of total annual change. It means that random factors explain only 3% proportion of total variation. Correlation and regression coefficients statistically significant. Corresponding to 1 billion increase in GNP the exports increase by 0.22

million USD. Thus Indian exports to China are much less responsive to change in GNP then Indian imports from China.

It is probable that very few Indian export goods are required by the Chinese economy, or the exportable surplus produced by Indian industries is not sufficiently changing through time. Policy bottlenecks may also constrain exports. Alternatively the prices of Indian exports may be much lower than those of imports. This may be one factor which may explain continuously high trade imbalance of India with China. Policy makers have to find out the solution to this problem and more intensive research may be required; it is probable that the current emphasis on Make In India may affect Indian exports to China positively. This means low complementarity accounts for inability of India to export such goods to China which it needs. It indicates the urgent need for diversification of India's trade with China. This is warranted even otherwise in view of the fact that the trade balance is highly favorable to China. The import policy of China vis a vis India may need to be adjusted to address this issue.

Results of Random Walk Model and Dickey Fuller Test: Indo-China tourism

Tourism as an industry comprises total number of tourists coming to and going from India to all countries of the world, while Sino-Indian tourism comprises incoming and outgoing tourists from India to China. Tourism involves expenditure on (i) intercountry and within country travel, (ii) boarding and lodging, and (iii) purchases of goods and services by the tourists. The paper considers only the number of tourists coming to and going out of India to all countries of the world and in and outgoing persons from India to China. This limitation is due to data difficulties relating to composition of expenditure by tourists. First part of this section provides importance of Indo-China tourist trade relative to India's global tourist trade during 2006-2016.

i. RWM Indo-China Tourism

Table 7 – RWM Indo-China tourism (2006-2016)

India		
Arrival without Drift and Without trend (from China to India)	$\widehat{\Delta ACI_t} = 0.11 ACI_{t-1}$ (10)	t = 5.01 R^2 = 0.691 F = 23.61
Arrival with Drift (from China to India)	$\widehat{\Delta ACI_t} = 6988.05 + 0.0586 Y_{t-1}$ (11)	t = 0.60 & 1.55 R^2 = 0.0838 F =0.589
Arrival with Drift and Trend (from China to India)	$\widehat{\Delta ACI_t} = 41912.2 + 11951.25t - 0.669 ACI_{t-1}$ (12)	t = 1.61, 1.45 & -1.43 R^2 = 0.225 F =1.75
Departure without drift and without trend From India to China	$\widehat{\Delta DIC_t} = 0.0444 DIC_{t-1}$ (13)	t = 2.81 R^2 = 0.431 F =7.81
Departure with Drift From India to China	$\widehat{\Delta DIC_t} = 64235.16 - 0.049 DIC_{t-1}$ (14)	t = 1.09, & -0.67 R^2 = 0.0289 F =0.35
Departure with Drift and Trend From India to China	$\widehat{\Delta DIC_t} = 337040.5 + 32898.6t - 0.9502 DIC_{t-1}$ (15)	t = 2.68, 2.43 & -2.96 R^2 = 0.409 F =2.99

The above three equations of arrivals of tourists in India from China furnish contradictory results. The coefficient of lagged tourists in first equation is highly significant statistically while the coefficients of lagged arrivals in other two equations are not significant. The last equation also indicates absence of stochastic trend. To be on safer side for avoiding spurious results this series is considered nonstationary.

The first and third equations of this set show the coefficients of the lagged departures of tourists from India to be highly significant statistically. Besides the third equation also indicates the existence of stochastic trend, so the series is taken to be non-stationary.

Total Trade: Total Sino-Indian Tourism as a function of Total Sino-India Trade

As the time series of core variables has been revealed to be non-stationary by the Dickey Fuller test,

Engel Granger test of co integration has been applied to assess the genuine nature of results furnished by the regression models. Total Tourists from /to China are treated as a function of Indian Imports/Exports to China. OLS estimates are reported hereunder.

Regression equation: Total Tourists

(t)= 0.2732 + 1.37E-07 Total Trade (t), R^2= 0.97,
F= 788.79, P=1.0975E-15 t: (16.08) (28.05)
D-W:d=2(1-0.253)=1.49 Root: 1-0.153=0.84<1

The function fits the data well and it explains 97% of total variation to outbound tourists to China.

Coefficients of correlation and Regression are statistically significant at 0.05% probability corresponding to 1mn increase in Trade increase in Sino-Indian tourists is 1.37E-08 E-08 millions. The function is free from autocorrelation as Durbin-Watson statistic is not significant at 0.01% probability. Root of the equation is less than 1 as per Tau test. Thus, the variables are well co-integrated as required Engel-Granger test of co-integration.

Inbound; Sino-Indian Tourism as a function of Sino-India Trade (Imports)

Inbound Tourists from China are treated as function of Indian Imports from China. OLS estimates are reported hereunder.

Regression equation: Inbound Tourists

(t)= 0.0189 + 4.99E-08 Indian Imports(t),
R^2= 0.97, F= 617.509, P=8.38 E-15
t: (3.33) (24.89) D-W:d=2(1-0.14)= 1.72
Root: 1-0.17=0.83<1

As the earnings from tourists from China maybe used to pay partially Import bills from China so the inbound tourists have been regressed on Imports from China. The function fits the data well and it explains 97% of total variation to outbound tourists to China. Coefficients of correlation and Regression are statistically significant at 0.05% probability corresponding to 1mn increase in exports increase in Inbound tourists is 4.99 E-08 millions. The function is free from autocorrelation as Durbin-Watson statistic is not significant t at 0.01% probability. Root of the equation is less than 1 as per Tau test. Thus, the variables are well co-integrated as required Engel-Granger test of co-integration.

Outbound: Sino-Indian Tourism as a function of Sino-India Trade (Exports)

Outbound Tourist to China is treated as function of Indian Exports to China. OlS estimates are reported hereunder.

Regression equation: Outbound Tourists

(t)= 0.2214 +5.36 E-07 Indian Exports (t),
R^2= 0.82, F= 77.89, P=9.34 E-08 t: (5.48) (8.82)
D-W:d=2(1-0.165)= 1.67 Root: 1-0.371.=0.63<1

As expenses of outbound tourists are met from Export earnings, outbound tourists are regressed on Indian exports to China. The function fits the data well and it explains 82% of total variation to outbound tourists to China. Coefficients of correlation and Regression are statistically significant at 0.05% probability corresponding to 1mn increase in exports increase in outbound tourists is 5.36 E-07 millions. The function is free from autocorrelation as Durbin-Watson statistic is not significant t at 0.01% probability. Root of the equation is less than 1 as per Tau test. Thus, the variables are well co-integrated as required Engel-Granger test of co-integration.

Sino-Indian Tourism – World Tourism Regression

Sino-Indian tourism / World Tourism = 0.035406 +6.56E-11
Sino-Indian Trade/World/Trade,
R^2=0.8349, F=75.8894,P=2.97E-07
t=(150.97) (8.71)
D-W=d=2(1-0.1606)=1.67
Root = 1-0.232 = 0.77<1

The regression of Sino-Indian Tourism as a proportion of World Tourism on Sino-Indian trade as a proportion of World Trade, fits the data well; The equation explains 83. 49% of total change in the dependent variable. Coefficient of correlation and coefficient of independent variable are statistically significant. The function is free from the malady of autocorrelation as a Durbin-Watson d statistics is significant at 0.01 probability. Besides the root of the equation 0.77 is less than 1 and statistically significant as per Tau test. Thus, the variables of the equation are well co-integrated as per Engel-Granger Test. Hence the results are genuine. Corresponding to 1 unit change in independent variable the Sino Indian tourism as a proportion of India's world tourism changes by 6.5 units.

Table 8 – Sino-India and India-World Tourism 2001-2019

Year	Dep/Outbound total Indians departing to all worlds (millions)	Total No dep/outgoing from India to China (millions)	Arr/Inbound total foreigners in India (millions)	Total No Arr/inbound from China to India (millions)	Total Indians dep/outbound + foreign arr/inbound/from/to world (millions)	Total tourist to/from China/India (millions)	Indo-China tourism as proportion of India/s world tourism
2001	4.56	0.209	2.54	0.014	7.1	0.223	2.795
2002	4.94	0.239	2.38	0.015	7.32	0.254	3.076
2003	5.35	0.272	2.73	0.021	8.08	0.293	2.960
2004	6.21	0.311	3.46	0.034	9.67	0.345	2.795
2005	7.18	0.355	3.92	0.048	11.10	0.403	2.833
2006	8.34	0.405	4.45	0.062	12.79	0.467	2.874
2007	9.78	0.462	5.08	0.088	14.86	0.551	2.925
2008	10.87	0.437	5.28	0.098	16.15	0.535	3.059
2009	11.07	0.449	5.17	0.100	16.24	0.549	3.141
2010	12.99	0.549	5.78	0.120	18.77	0.669	3.247
2011	13.99	0.606	6.31	0.142	20.3	0.749	3.217
2012	14.92	0.610	6.58	0.169	21.5	0.779	3.267
2013	16.63	0.677	6.97	0.175	23.6	0.851	3.386
2014	18.33	0.710	7.68	0.181	26.01	0.891	3.387
2015	20.38	0.731	8.03	0.206	28.41	0.937	3.538
2016	22.03	0.751	8.80	0.251	30.83	1.002	3.503
2017	23.94	0.799	10.04	0.251	33.98	1.050	3.384
2018	26.3	0.819	10.56	0.247	36.86	1.066	3.491
2019	26.92	0.709	10.93	0.282	37.85	0.991	3.463

Total Indo-China Tourism and Trade relative to India's world tourism and world trade (ICP WTr): World tourism as a function of world trade of India.

World Tourism (t) = 5.82 + 5.28E-07
World Trade(t), R^2 = 0.9263,
F=213.714, P=4.65E-11
t= (4.99) (14.61)
D-W: d=2 (1-0.24) =1.52
Root= 0.84 <1

The above function fits the data of India's world tourism and India's world trade well. As the function explains 92.6 % of the total variation in India's tourism over the years. The coefficients of correlation and regression are statistically significant at 0.05 probability. The function is free from autocorrelation since DW (d) is not significant at 0.01 probability. Besides less than 1 value of the root of the equation is not significant according to the critical value of Tau-test. Hence the variables of the equation are well cointegrated as per Engel Granger test. The regression results are genuine and hence acceptable.

The above analysis lends credible support to the thesis of this study that tourism and trade are closely related (positively) to each other. However, this initial thesis may need further testing with data of countries other than data of India and China, which constitutes the base of this study. This is suggested in accordance with Karl Poppers dictum that the theory should be repeatedly tested with different data sets for final acceptance.

Findings and Conclusion

a. Distribution of the values of GNP, Exports, Imports, Total Trade, Inbound/Outbound tourists are not found to be either skewed or concentrated in few years as per the descriptive statistics. This suggests the distribution to be approximately normal and time series to be stationary. However, these inferences are rejected by the more powerful and direct Dickey Fuller test of stationarity of time series.

b. Imports exports and total trade of India with China are found to be a positive functions of GNP

c. Tourists-Inbound/Outbound and their sum are a direct function of total commodity trade. However total tourist trade of India with China as a proportion of world tourist and commodity trade are positively related. But the results suggest that there is scope for accelerated growth of both tourism and trade of India with China and the world. The study quantifies the degree and direction of relationship between Sino-Indian tourism, trade, and GNP as well as the tourism, trade with the rest of the world. The study has formulated an innovative thesis that trade, GNP and tourism are positively related with each other.

The objectives of the study outlined in the paper have been realized by the findings of the empirical investigation.

Scope for further research

The thesis may be tested empirically with data of other countries by other researchers.

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