

Analysis of India China Bilateral Trade Relations

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ABSTRACT**Fig 1: India-China Relations**

(Source: <https://rstv.nic.in/fourth-round-india-china-talks-conclude.html>)

This research project is an attempt to examine the Bilateral Trade relationship between the two emerging economies India and China. India and China are the fastest growing economies in Asia as well as in the world which currently account for 30% of world's population and 20% of world's GDP. Both economies are classified by many international agencies as emerging markets with scope for rapid economic growth. They play an increasingly crucial role in world economics affair.

Even though India and China are low and middle-income countries, but their tremendous size combined with high growth rate indicates that they make a substantial and continuously increasing contribution to the world economic output. Therefore, the success or failure of the each country to maintain their rapid GDP growth rate in the future will have a large impact not only on their own economies but also on the world economy as a whole.

In both countries, growth has accelerated in recent decades as trade liberalisation and market-oriented structural reforms have deepened. A glance at both countries' experience suggests a number of similarities in their reform paths. Despite very different political systems, both countries followed a reform path that markedly reduced the role of the government in economic activity and allowed a greater degree of openness to foreign trade. Reform started earlier in China (in 1980s) than in India (in 1990s). Moreover, the opening to trade has proceeded at a much more rapid pace in China.

A stronger private sector has always been an asset for India. Even though the private sector was considerably regulated on its investment planning, but this was eased in the early 1990s. On the other hand, in China the private sector has only emerged in past decade, as the result of a more favourable legal framework and the sale of government-owned assets.

China's economy has moved from a Soviet-style centrally-planned economy to a market-based economy. Since the market reforms of 1978, it has emerged as a rapid and socially developed country, while India on other hand is developing into an open-market economy post 1991 LPG reforms. Post liberalization of foreign trade, comparative cost advantage replaced the self-sufficiency as the basic tenant of trade policy and both the countries are now pursuing market-oriented and outward-looking policies.

China - India trade relations are the most crucial part of bilateral relations between India and China. The India-China Joint Business Council regulates the India-China bilateral trade, which ensures that both the countries freely exchange products and services.

The legacy of relations between India and China began to change in the 1980s, with the shift in both countries from an import substitution to an export promotion strategy for both the countries. And with the signing of trade agreement of 1984, India and China provided for Most Favoured Nation Treatment to each other.

It was in 1992 that the India and China got involved in a full-fledged bilateral trade relation. The year 1994 marked the beginning of a new era in the India- China economic relations when both the countries signed an agreement to avoid double taxation.

Major exports of India to China include ores, ash, iron and organic chemicals, etc whereas major Chinese exports to India include electrical machinery and equipment, nuclear reactors and oils, etc.

With China replacing USA as the largest trade partner of India for the year 2020, the decoupling of India-China in trade and commerce front seems to be a tough task. With the recent attempts of China in destabilizing the Indian borders, we have seen an increase in the negative sentiments among the Indian consumers regarding the trade with China and an increased debate over the relevance of India-China trade for the economic growth of India.

This project attempts to find the relation between Export-Import with the GDP growth. The project investigates the major trends and changes in the Import-Export of India, Total Trade between India and China, Gross Domestic Product (GDP) trends, and the impact of bilateral trade between Indian and China on India's Gross Domestic Product (GDP) growth. We will be using Exploratory Data Analysis (EDA) along with machine learning technique- Linear Regression. The findings can also be used to draw policy implications and strategy for future trade and economic co-operation between the two Asian developing economics.

Keywords:-India-China trade, Indo-China Relations, MFN, Exploratory Data Analysis, Linear Regression, Univariate Time Series Analysis, Strategy, Economy, Economic Cooperation.

CHAPTER ONE INTRODUCTION

Trade is an important fuel of economic growth, China and India are two emerging economies of the world. Both the economies have grown in the post-reform through economic liberalisation which has enabled them to increase external linkage with rest of the world.

There is some competition among Chinese and Indian producers in export markets for goods such as textiles, garments, leather goods and light machinery. China's accession to the World Trade Organisation could potentially have long-term adverse consequences for the growth of Indian exports in these sectors, and China's better and growing integration into global production networks for manufactured goods could have negative implications for India's exports in general.

Bilateral trade between India and China having a potential worth nearly \$100 billion in year 2015 has created huge and unprecedented opportunities for both countries' business and investors while bringing about a greater stability in the region. Economic cooperation between India and China from 1995-2019 have been a remarkable story, from very modest beginning in 1995 of \$1.14 billion to \$81.8 billion in 2019.

Overall top 10 export destinations for India are:

Country	Exports from India (\$ billion)	Percent of total exports
USA	54.2	16.8
UAE	29.7	9.2
China	17	5.3
Hong Kong	11.5	3.5
Singapore	10.7	3.3
UK	8.82	2.7
Netherlands	8.75	2.7
Germany	8.6	2.7
Bangladesh	8.3	2.6
Nepal	7	2.2

Table 1: Top 10 export destinations for India in 2019

(Source: <http://www.worldstopexports.com>)

So USA is the most preferred export destination for India before UAE and China. Also with USA India experiences its highest trade surplus of \$19.5 billion (2019).

Overall top 10 export destinations of China are:

Country	Exports from India (\$ billion)	Percent of total exports
USA	418.6	16.8
Hong Kong	279.6	11.2
Japan	143.2	5.7
South Korea	111	4.4
Vietnam	98	3.9
Germany	79.7	3.2
India	74.9	3
Netherlands	73.9	3
UK	62.3	2.5
Taiwan	55.1	2.2

Table2:Top 10 export destinations for China in 2019

(Source:<http://www.worldstopexports.com>)

Even though China has become India's largest trade partner again in 2020 replacing USA, as per Ministry of Commerce.China depends on India for around 3% of its total exports with India being its 7th largest export destination whereas India's export to China is close to 5.3% of its total export making it third largest export destination for India. And if we consider Hong Kong also then the figure reaches 8.8% for India indicating India depends more on China in terms of percentage of exports. But in absolute terms China exports more than 4 times the exports of India.

Trade deficit between India and China is highly unfavourable for India has always been an issue of major concern for Indian government which it keeps on highlighting in all bilateral trade talks. Both India and China also signed an agreement in 2014 to reduce this trade deficit with lowering of various tariff and non-tariff barriers for Indian exports in China along with better market access by 2019, but the agreement did not achieve much as the trade deficit skyrocketed after that.

The major reason for this is accounted for India's dependency more on raw materials and low end technology products for its exports basket while China's exports rely more on finished products and high end technology products. This coupled with better infrastructure, ecosystem and government support makes it hard for India to resist the Chinese exports to India making the growth of Imports from China much larger than the growth of exports from India to China.

The following table captures the trend in Trade between India and China since 1995.

Year	Export	Import	Trade Deficit (in billion USD)
1995	331.6	810.1	0.47
1996	614.8	756.91	0.14
1997	717.95	1112.05	0.39
1998	427.16	1096.71	0.66
1999	539.04	1282.89	0.74
2000	831.3	1502.2	0.67
2001	951.95	2036.39	1.08
2002	1975.48	2792.04	0.81
2003	2955.08	4053.21	1.09
2004	5615.88	7097.98	1.48
2005	6759.1	10868.05	4.1
2006	8321.86	17475.03	9.15
2007	10871.34	27146.41	16.27
2008	9353.5	32497.02	23.14
2009	11617.88	30824.02	19.2
2010	14168.86	43479.76	29.31
2011	18076.55	55313.58	37.23
2012	13534.88	52248.33	38.71
2013	14824.36	51034.62	36.21
2014	11934.25	60413.17	48.47
2015	9011.36	61707.95	52.69
2016	10171.89	61283.03	51.11
2017	13333.53	76380.7	63.04
2018	16752.2	70319.64	53.56
2019	16612.75	65260.75	48.64

Table 3: Trade trend between India and China

(Source: <https://tradestat.commerce.gov.in/eidb/>)

This table indicates that over the period of time, the trade deficit has gone highly against the India from \$0.47 billion in 1995 to \$48.64 billion in 2019 attaining the maximum value of \$63.04 billion in 2017. Due to this very reason, the trade of India with China is not seen as a very healthy affair for the Indian economy.

Now let us try to capture the trend in GDP growth of both the countries. India and China are considered as fastest growing economies in the world. With both the countries being developing countries having a very large population, there is enough potential in both the countries to become economic superpower in the future.

Let us first consider the trend in the GDP growth of both the countries from 1995-2019.

Year	India	China
1995	6.658924	10.9539543
1996	7.549522	9.92255675
1997	4.049821	9.23677989
1998	6.184416	7.84595179
1999	8.845756	7.6616515
2000	3.840991	8.49009341
2001	4.823966	8.33573348
2002	3.803975	9.13363079
2003	7.860381	10.0380305
2004	7.922937	10.1136214
2005	7.923431	11.3945918
2006	8.060733	12.7209557
2007	7.660815	14.2308609
2008	3.086698	9.65067892
2009	7.861889	9.39872563
2010	8.497585	10.6358711
2011	5.241345	9.55083218
2012	5.456359	7.86373645
2013	6.386106	7.7661501
2014	7.410228	7.42576366
2015	7.996253	7.04132888
2016	8.256306	6.8487622
2017	7.043821	6.94720079
2018	6.119587	6.74977383
2019	4.180728	6.11011829

Table 4: GDP growth of India and China

(Source: <https://tradedstat.commerce.gov.in/eidb/>)

The GDP growth rates of China and India are estimated at 4.18% and 6.11% in 2019, respectively. During the period 1995-2019, Average growth domestic product (GDP) growth of China was 9.04% compared with India's 6.50% for the same period. During this period, China attained the maximum GDP growth of 14.23% in year 2007 and minimum of 6.11% in 2019. While India's GDP growth attained its maximum value of 8.84% in 1999 and minimum of 3.08% in 2008.

Out of 25 years from 1995 to 2019, China's GDP grew by more than 10% in 7 years while India didn't even touch the double digit mark for even once. India's growth rate was 8-10% in 4 years, while China in 7 years.

In general, trade has a positive and significant impact on economic growth as highlighted by many research work in the past. However there are many studies which also challenge this notion. In this research project, we are trying to find whether is a significant relationship between export and import with GDP for India and China along with drawing a comparison of trade infrastructure & environment between the nations.

A. Research Objectives

- To show the overview of Indo-China bilateral trade.
- To examine the relationship of Export to China on India's GDP growth.
- To examine the relationship of Import from China on India's GDP growth.
- To examine the relationship of Export to China on China's GDP growth.
- To examine the relationship of Import from China on China's GDP growth.
- To compare key metrics and indicators of trade of both the countries.

B. Research Hypothesis

- **Hypothesis 1:** A large and significant portion of India's GDP growth does not come from growth of exports from India to China.
- **Hypothesis 2:** There is no causal relationship between export growth of India-China trade and GDP growth of India, that is, growth in exports from India to China does not cause the GDP growth of India.
- **Hypothesis 3:** A large and significant portion of China's GDP growth does not come from growth of exports from India to China.
- **Hypothesis 4:** There is no causal relationship between export growth of India-China trade and GDP growth of China, that is, growth in exports from India to China does not cause the GDP growth of China.
- **Hypothesis 5:** A large and significant portion of India's GDP growth does not come from growth of imports from China to India.
- **Hypothesis 6:** There is no causal relationship between import growth of India-China trade and GDP growth of India, that is, growth in imports from China to India does not cause the GDP growth of India.
- **Hypothesis 7:** A large and significant portion of China's GDP growth does come from growth of imports from China to India.
- **Hypothesis 8:** There is no causal relationship between import growth of India-China trade and GDP growth of China, that is, growth of imports from China to India does not necessarily cause the GDP growth of China.

CHAPTER TWO

REVIEW OF LITERATURE

- **Bhattacharya and Bhattacharyay (2007)** in their research paper “*Gains And Losses Of India-China Trade Cooperation – A Gravity Model Impact Analysis*” attempted to analyse the likely advantages in the terms of profits or losses in the imports of both India as well as China due to different PTAs (Preferential Trading Arrangements) and FTAs (Free Trade Arrangements) by using the gravity model. The study concluded that overall in the short run India’s potential gain is relatively less when compared with China and the main reason for this is India’s high tariff rates but overall in the longer run, India’s gains are higher than China once the tariff levels of India are brought at par. The Free trade arrangement is a win-win situation for both the countries and is coherent with their growing dominance in the global trade.
- **Bussiere and Mehl (2008)** in their research paper “*China’s and India’s roles in Global trade and Finance: Twin titans for the New Millennium?*” attempted to differentiate some of the major features of India’s and China’s role in international trade and finance. They measured the overall degree of their trade intensity and the depth of their bilateral relations by using the estimates from a gravity model, and also attempted to highlight the measures of revealed comparative advantages and economic distance. The main four findings of the research were- Firstly, analysing the trade in goods, it can be said that the overall degree of trade intensity of China is higher than the fundamentals suggest, however the opposite is true for India. Secondly, the exported goods from China seem to compete more with the goods from developed economies. While on the other hand, Indian exports are more low technology oriented. Thirdly, export of goods and services in case of China tend to complement each other, whereas in case of India, exports are rising mainly in less regulated sectors like IT-related services. Finally, both the countries-India and China, play a crucial role in the global trade.
- **Dimaranan, Ianchovichina and Martinr (2007)** in their research paper “*China, India, and the Future of the World Economy: Fierce Competition or Shared Growth?*” tried to highlight the implications of growth of India and China for the other developing countries.
- **Kowalski (2008)** in his research paper “*China and India: A Tale of Two Trade Integration Approaches*” compared the key characteristics of the trade integration processes and the economic outcomes in the two countries India and China. It highlighted that Chinese reforms in the area of manufacturing trade was likely to be one of the major reasons that has improved the economic performance of China in the past decades. While on the other hand, India has covered a long path in the field of tariff reduction on products in the non-agricultural category, but because of moderate protection policy by India the manufacturing sector is likely to face hurdles.
- **Kumari (2014)** in her research paper “*India’s foreign trade with China with special reference to agricultural commodities*” tried to investigate mainly the changes in India-China trade relations from the perspective of India since the liberalisation of trade in 1991. The study concluded that the liberalisation of trade has influenced the relation of India with the Chinese Government in a positive manner. The external sector’s emergence has helped both the countries in last two decades to improve their growth.
- **Kumari and Malhotra (2014)** in their research paper “*Trade-led growth In India and China: A comparative Analysis*” attempted to find out the export-import growth is affecting the economic growth of both the countries- India and China. The empirical findings of the study suggested that for India there was unidirectional causality running from GDP per capita to exports. However, no such causation was found between imports and GDP per capita. For China, a strong evidence of bi-directional causality was found from GDP per capita to exports/ imports and vice versa. The research concluded that China outperformed India, and the main reasons were- the speed of reforms, implementation of policies and the nature of political governance.
- **PHD Research Bureau (2018)** in their report on “*India – China Trade Relationship: The Trade Giants of Past, Present and Future*” did a comparative analysis of the India-China trade relationship. The study summarised that because of the cheap labour as well as economies of scale, China offers to India low-priced imports for example electronic devices, textiles and clothing, machinery, etc. Chinese products are

affecting our manufacturing units negatively especially the Indian toy industry. The report also predicted that with the shift in taste and preferences for Chinese products due to various reasons, coupled with the growing and competitive Indian production capabilities, the popular Chinese products in Indian market will witness a decline in the coming years.

- **Rivera and Tsigas (2005)** in their research paper “*How does China’s growth affect India? An Economywide Analysis*” attempted to analyze how Chinese economic growth impacts the Indian economy. They concluded that broadly the economic growth of China has unfavourable impact on the Indian economy. However, the Rest of Asian region, is likely to benefit from the economic growth of China. They also highlighted that China’s light manufacturing growth (which includes textiles, apparel, food processing industries) is likely to correspond to a decrease in the welfare for India. However, growth in the other industries, such as machinery, electronic equipment and transportation, has a beneficial effect on the Indian welfare.
- **Sibghat Ullah Farooqui (2016)** in his research article “*Bilateral trade and economic growth of China and India: A comparative study*” attempted to examine the Bilateral Trade and Economic Growth between China and India. He concluded that the China was more focussed on export to India. The bilateral trade between these two countries was unfavourable to India and along with that the balance of trade was also unfavourable to India. Overall, the China has performed better than India and the reason for this is not simply the timings of changes in economic policies but also the speed with which the reforms were carried out, the grass root implementation of policies and nature of political governance also mattered.
- **Siddiqui and Alam (2017)** in their research paper tried to find out the trade pattern of India and China from year 2005 to 2016 and also the research paper attempted to investigate the percentage of Chinese electronic toys in India. Their search study concludes that the introduction of liberalization and economic reforms benefitted both India and China in not only integrating with the world economy but also attaining higher growth. The Indian markets are overwhelmed with the Chinese toys, which are tough competition for the domestic Indian toy industry.
- **Singh and Santpal (2014)** in their research paper “*A Comparative study of India-China Bilateral trade*” tried to study the changes in Balance of Trade of India in relation to the total imports or export to China. The study concluded that the bilateral trade between India and China was not in favour of India.
- **Suresh (2012)** in his research paper “*Exchange Rate Impact on Bilateral Trade between India and China*” tried to investigate how Chinese Renminbi (RMB) affected trade of India with China. The findings concluded that the appreciation in Chinese Renminbi RMB will impact trade of India, mainly with higher elasticity for imports.
- **Svensson (2012)** in his research paper on “*Sino-Indian Relations: Complex Challenges in a Complex Relationship*” aims to analyse how the trade and cooperation plays a role in moving the attention away to a more positive direction from security-related issues. The study summarises that even though the trade and cooperation do play a significant role in balancing the India-China relations, but it could not be called as the only factor preventing any border security issue being raised or in simple terms, moving attention from border related issues to a positive direction.
- **Wani and Dharmi (2013)** in their research paper “*Indo-China Trade: Intensity and Potential for Future Trade*” attempted in highlighting how the bilateral trade between the countries- India and China, augments in growing their partnership for the mutual benefit of both the nations in the coming time. The trends in the growth rate of China-India trade shows a huge potential for the future focused on their political achievements.

CHAPTER THREE RESEARCH METHODOLOGY

The research considered for this project is secondary research where the data is compiled and analysed from various national and international organizations/sources like Ministry of Commerce, World Bank, WTO, etc.

The Data Analysis further will include two methods:

A. Exploratory Data Analysis (EDA):

(Source: NIST- ITL)

Exploratory Data Analysis (EDA) is an approach/philosophy for data analysis that employs a variety of techniques (mostly graphical) to

- a) maximize insight into a data set;
- b) uncover underlying structure;
- c) extract important variables;
- d) detect outliers and anomalies;
- e) test underlying assumptions;
- f) develop parsimonious models; and
- g) determine optimal factor settings

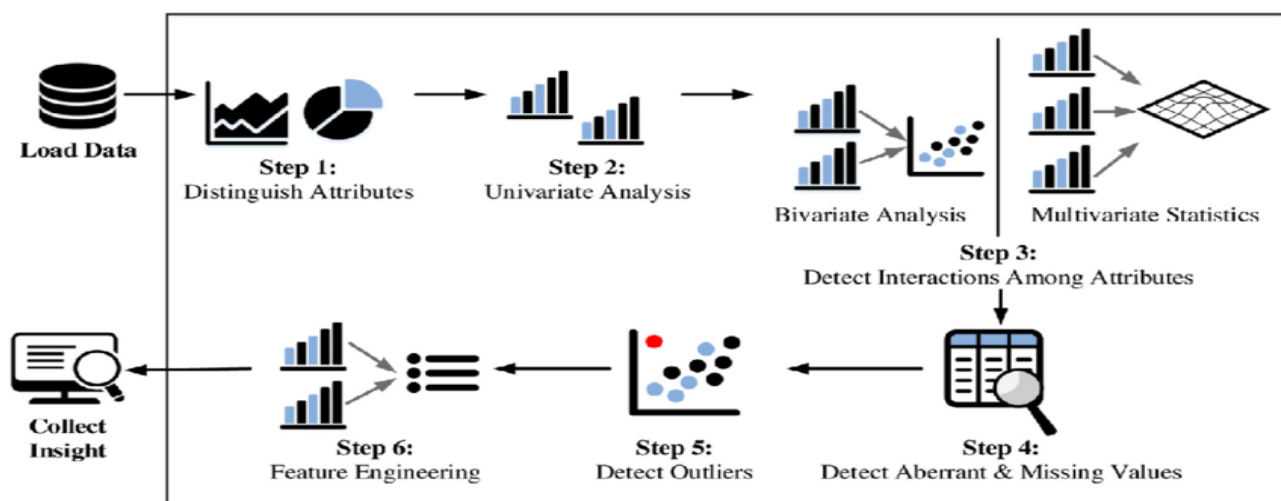


Fig 2: Exploratory Data Analysis Process

(Source: A comprehensive review of tools for exploratory analysis of tabular industrial datasets (2018) by Ghosh, A., Nashaat, M., Miller, J., Quader, S., & Marston Visual Informatics Journal, 2(4), 235-253)

B. Linear Regression:

Linear regression attempts to model the relationship between two variables by fitting a linear equation to observed data. One variable is considered to be an explanatory variable, and the other is considered to be a dependent variable. (Yale University)

It is the study of linear, additive relationships between variables. Let Y denote the “dependent” variable whose values you wish to predict, and let X_1, \dots, X_k denote the “independent” variables from which you wish to predict it, with the value of variable X_i in period t (or in row t of the data set) denoted by X_{it} . Then the equation for computing the predicted value of Y_t is: (Duke University)

$$\hat{Y}_t = b_0 + b_1X_{1t} + b_2X_{2t} + \dots + b_kX_{kt}$$

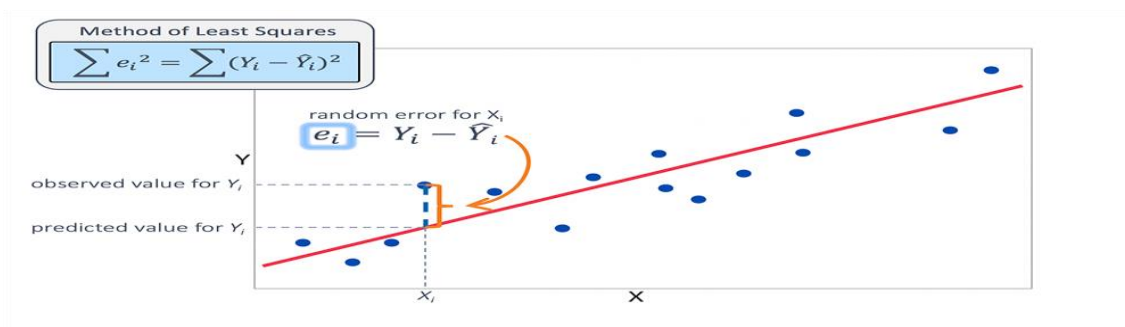


Fig 3: Linear Regression – Best-fit line

(Source: JMP- SAS)

C. Conceptual Framework

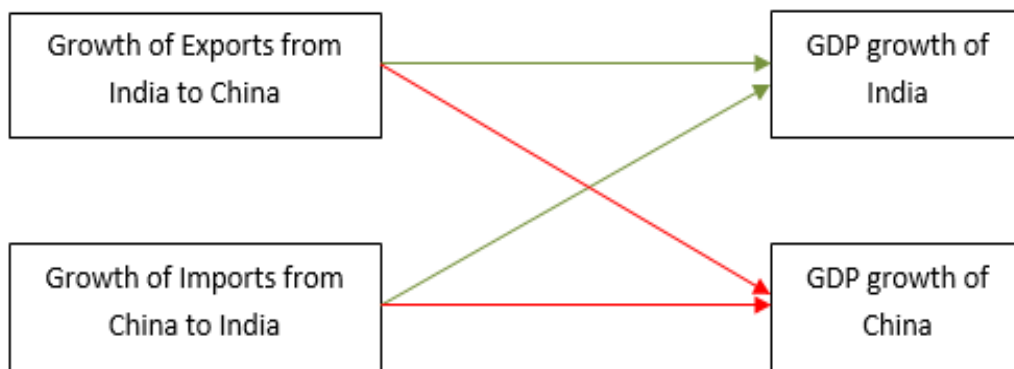


Fig 4: Conceptual Framework

The research tries to establish a statistical linear relationship between these four variables.

CHAPTER FOUR DATA ANALYSIS

The study is conducted on the trade data of India and China for a period of 25 years, starting from 1995 to 2020. The data has been collected through the following national and international official websites:

- 1) <https://tradestat.commerce.gov.in/eidb/default.asp#>
- 2) <https://data.worldbank.org/country/>
- 3) <https://wits.worldbank.org/countrystats.aspx?lang=en>
- 4) <https://www.trademap.org/Index.aspx>
- 5) <https://unctadstat.unctad.org/countryprofile/en-gb/index.html>
- 6) <https://comtrade.un.org/data>

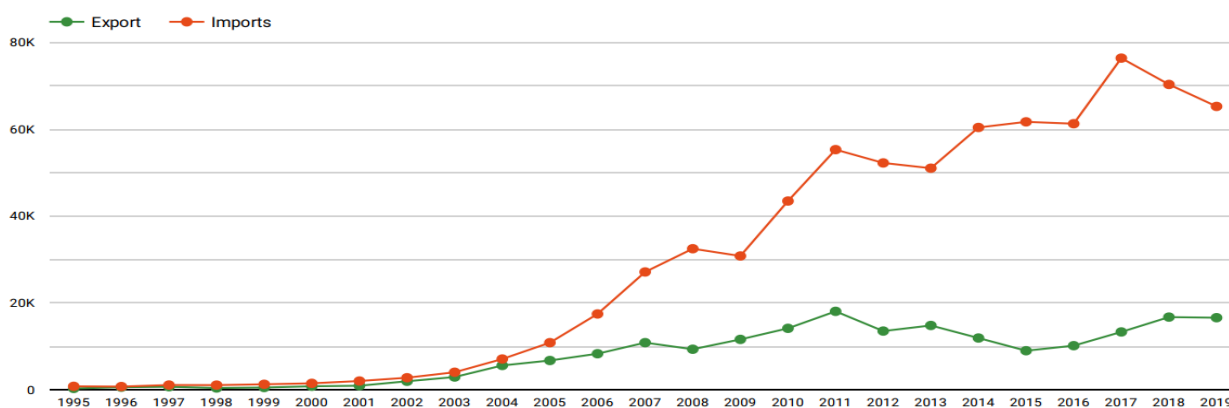


Fig 5: Export from India to China and Import from China to India in million USD

The above graph indicates that the Trade between India and China has progressed in favour of China over the period of time. The imports in 1995 were around 150% of exports in 1995, but this figure doubled itself to reach 300% by 2019, indicating a sustained increase in the Trade Deficit, which is unfavourable to India. In 1995, the exports from India to China were 331.6 Million USD while imports from China to India were 810.1 Million USD and these figures reached to 16.61 Billion USD and 65.26 Billion USD respectively.

The graph shown below (figure 8) shows the GDP growth comparison of India and China from 1995 to 2019.



Fig 6: GDP growth of India and China from 1995 to 2019.

On an average, the GDP growth of China in last 25 years has been around 9% with the number often reaching to double digit mark crossing even 14% in 2007. While in case of India, the GDP growth rate in last 25 years on an average has been around 6.5% with peak touching 8.8% in 1999.

Now let us analyse, how the bilateral trade affects the GDP growth of both the countries.

We have drawn a best fit line for the points on the graph. The slope of line can be observed to be very small, indicating that there is very weak relationship between the GDP growth of India and the Exports growth from India to China.

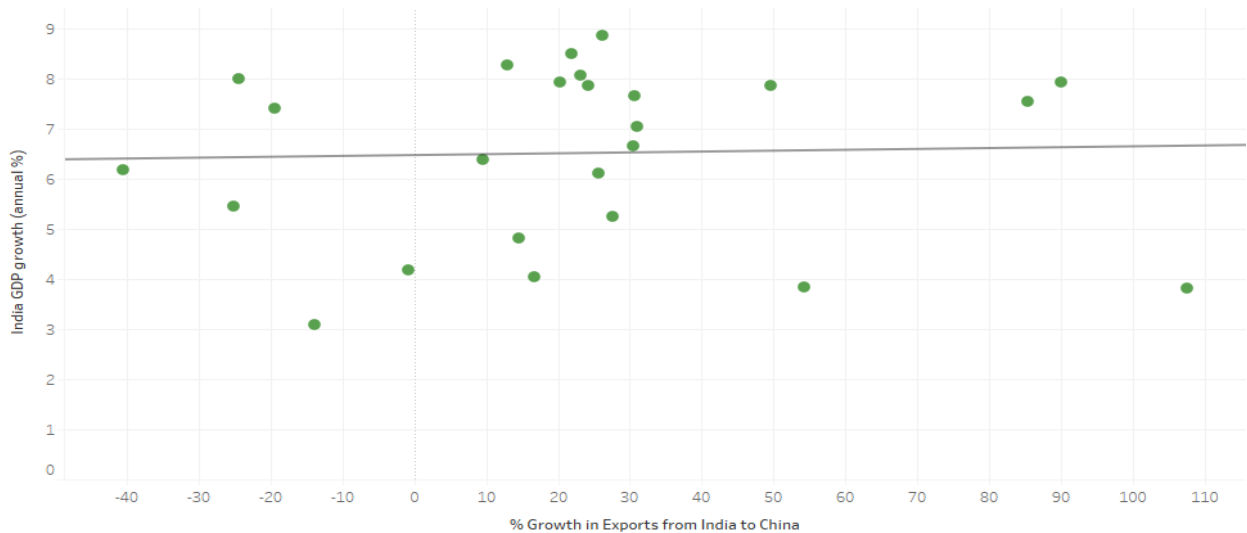


Fig 7: Scatter plot between GDP growth of India and Growth of Exports from India to China.

The details of the linear model are given below:

Model formula: (% Growth in Exports + intercept)

Number of modeled observations: 25

Number of filtered observations: 0

Model degrees of freedom: 2

Residual degrees of freedom (DF): 23

SSE (sum squared error): 71.6253

MSE (mean squared error): 3.11414

R-Squared: 0.0012736

Standard error: 1.76469

p-value (significance): 0.865519

Individual trend lines:

Panel	Line	Coefficients	Value	StdErr	t-value	p-value	
Row	p-value	DF	Term				
India GDP growth (annual %)	0.865519	23	% Growth in Exports	0.0017397	0.0101582	0.171258	0.865519
			intercept	6.46873	0.423775	15.2646	< 0.0001

Fig 8: Model statistics of GDP growth of India predicted by Exports growth from India to China.

In the above model, GDP growth of India is dependent variable and Growth of Exports from India to China is independent variable. Here, we can observe that the R squared value is very low, that is 0.00127, coupled with insignificant p-value of 0.86, indicating that the Exports growth from India to China does not contribute much significantly to the GDP growth of India.

Therefore, a large and significant portion of India’s GDP growth does not come from export with China.

Now analysing the above model while changing the variables, that is, taking GDP growth of India as independent variable and Growth of Exports from India to China as dependent variable. The details of the model are given below:

Model formula:	(India GDP growth (annual %) + intercept)			
Number of modeled observations:	25			
Number of filtered observations:	0			
Model degrees of freedom:	2			
Residual degrees of freedom (DF):	23			
SSE (sum squared error):	30140.7			
MSE (mean squared error):	1310.46			
R-Squared:	0.0012736			
Standard error:	36.2003			
p-value (significance):	0.865519			
Individual trend lines:				
Panel	Line	Coefficients		
Row	Column	p-value	DF	Term
% Growth in Exports	India GDP growth (annual %)	0.865519	23	India GDP growth (annual %)
				intercept
				Value
				StdErr
				t-value
				p-value
				0.73207
				4.27467
				0.171258
				0.865519
				18.3259
				28.75
				0.637424
				0.530144

Fig 9: Model statistics of Exports growth from India to China predicted by GDP growth of India.

In the above model, we are predicting the Growth in exports from India to China with the help of GDP growth of India. Here, we can observe that the R squared value is very low, that is 0.00127, coupled with insignificant p-value of 0.86, indicating that the GDP growth of India does not contribute much significantly to the Exports growth from India to China.

Therefore, on the basis of both the models, we can conclude that **there is no significant relationship between GDP growth of India and Growth of Exports from India to China.**

Now applying Granger Causality Tests to confirm if there is causal relationship between the two variables, that is, GDP growth of India and Growth in Exports from India to China.

Pairwise Granger Causality Tests
 Date: 02/15/21 Time: 17:30
 Sample: 1995 2019
 Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
__GROWTH_IN_EXPORTS does not Granger Cause INDIA_GDP_GROWTH__ANNUAL__	23	0.52356	0.6012
INDIA_GDP_GROWTH__ANNUAL__ does not Granger Cause __GROWTH_IN_EXPORTS		3.60197	0.0483

Fig 10: Granger Causality test between Exports growth from India to China and GDP growth of India.

From the above results of Granger Causality test, we can observe that in case of first hypothesis, the F-statistic is very low and the p-value is insignificant (much greater than 0.05), so we cannot reject the null hypothesis.

Therefore, we can say that Growth in Exports from India to China does not causes the GDP growth of India.

However, it is interesting to note that, the F statistic even though not that high (3.6) but is still significant (p value= 0.04 < 0.05) for the second hypothesis, indicating that the GDP growth of India causes the growth of exports from India to China.

We have drawn a best fit line for the points on the graph. The slope of line can be observed to be small, indicating that there is weak relationship between the GDP growth of China and the Exports growth from India to China.

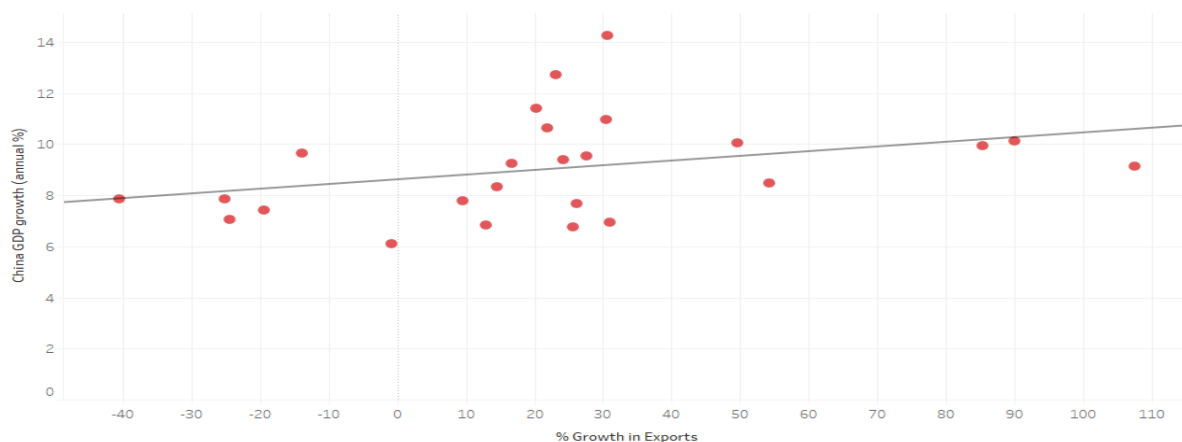


Fig 11: Scatter plot between GDP growth of China and Growth of Exports from India to China.

The details of the linear model is given below:

Model formula: (% Growth in Exports + intercept)
Number of modeled observations: 25
Number of filtered observations: 0
Model degrees of freedom: 2
Residual degrees of freedom (DF): 23
SSE (sum squared error): 82.5769
MSE (mean squared error): 3.5903
R-Squared: 0.109467
Standard error: 1.89481
p-value (significance): 0.10621

Individual trend lines:

Panes	Line	Coefficients						
Row	Column	p-value	DF	Term	Value	StdErr	t-value	p-value
China GDP growth (annual %)	% Growth in Exports	0.10621	23	% Growth in Exports	0.0183397	0.0109072	1.68143	0.10621
				intercept	8.61921	0.45502	18.9425	< 0.0001

Fig 12: Model statistics of GDP growth of China predicted by Exports growth from India to China.

In the above model, GDP growth of China is dependent variable and Growth of Exports from India to China is independent variable. Here, we can observe that the R squared value is low, that is 0.109, coupled with insignificant p-value of 0.10, indicating that the Exports growth from India to China does not contribute much significantly to the GDP growth of China.

Therefore, a large and significant portion of China’s GDP growth does not comes from exports from India to China.

Now analysing the above model while changing the variables, that is taking GDP growth of China as independent variable and Growth of Exports from India to China as dependent variable. The details of the model are given below:

Model formula:	(China GDP growth (annual %) + intercept)							
Number of modeled observations:	25							
Number of filtered observations:	0							
Model degrees of freedom:	2							
Residual degrees of freedom (DF):	23							
SSE (sum squared error):	26875.5							
MSE (mean squared error):	1168.5							
R-Squared:	0.109467							
Standard error:	34.1833							
p-value (significance):	0.10621							
Individual trend lines:								
Panes		Line	Coefficients					
Row	Column	p-value	DF	Term	Value	StdErr	t-value	p-value
% Growth in Exports	China GDP growth (annual %)	0.10621	23	China GDP growth (annual %)	5.96884	3.54985	1.68143	0.10621
				intercept	-30.8835	32.8202	-0.940991	0.356488

Fig 13: Model statistics of Exports growth from India to Chinapredicted by GDP growth of China.

In the above model, we are predicting the Growth in exports from India to China with the help of GDP growth of China. Here, we can observe that the R squared value is low, that is 0.109, coupled with insignificant p-value of 0.10, indicating that the GDP growth of China does not contribute significantly to the Exports growth from India to China.

Therefore, on the basis of both the models, we can conclude that **there is no significant relationship between GDP growth of China and Growth of Exports from India to China.**

Now applying Granger Causality Tests to confirm if there is causal relationship between the two variables, that is, GDP growth of China and Growth in Exports from India to China.

Pairwise Granger Causality Tests
 Date: 02/15/21 Time: 19:51
 Sample: 1995 2019
 Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CHINA_GDP_GROWTH__ANNUAL__ does not Granger Cause __GROWTH_IN_EXPORTS	23	0.31607	0.7330
__GROWTH_IN_EXPORTS does not Granger Cause CHINA_GDP_GROWTH__ANNUAL__		0.42982	0.6571

Fig 14: Granger Causality test between Exports growth from India to Chinaand GDP growth of China.

From the above results of Granger Causality test, we can observe that in case of first hypothesis, the F-statistic is very low and the p-value is insignificant (much greater than 0.05), so we cannot reject the null hypothesis.

Therefore, we can say that Growth in Exports from India to China does not causes the GDP growth of China.

Also in case of second hypothesis, we can observe that the F-statistic is very low and the p-value is insignificant (much greater than 0.05), so we cannot reject the second null hypothesis too.

Therefore, we can say that GDP growth of China to does not causes the growth of Exports from India to China.

We have drawn a best fit line for the points on the graph. The slope of line can be observed to be very small, indicating that there is very weak relationship between the GDP growth of India and the Exports growth from India to China.

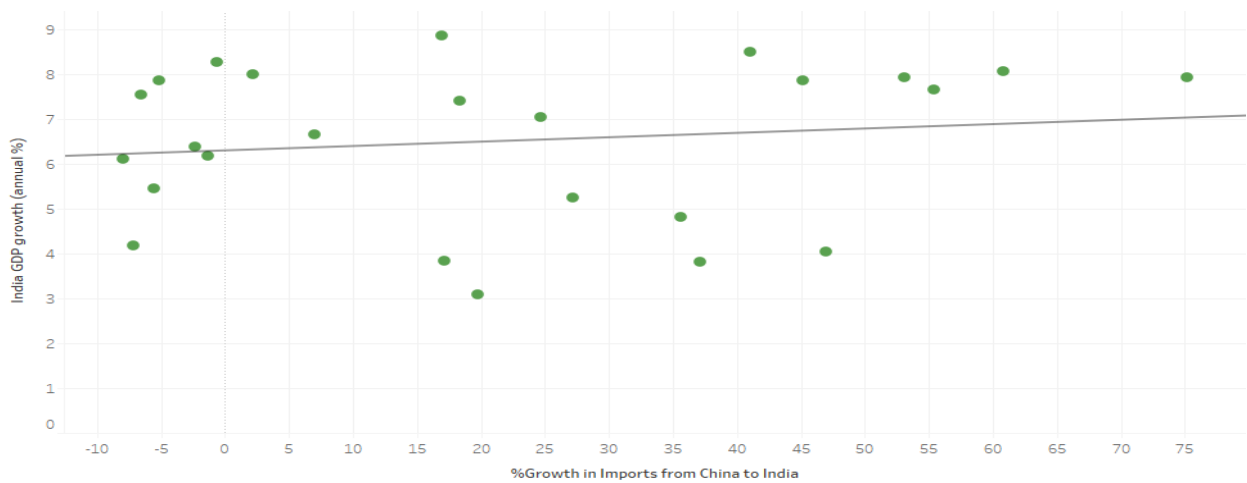


Fig 15: Scatter plot between GDP growth of India and Growth of Imports from China to India.

The details of the linear model are given below:

Model formula: (%Growth in Imports + intercept)
Number of modeled observations: 25
Number of filtered observations: 0
Model degrees of freedom: 2
Residual degrees of freedom (DF): 23
SSE (sum squared error): 70.3138
MSE (mean squared error): 3.05712
R-Squared: 0.0195607
Standard error: 1.74846
p-value (significance): 0.504909

Individual trend lines:

Panels		Line	Coefficients					
Row	Column	p-value	DF	Term	Value	StdErr	t-value	p-value
India GDP growth (annual %)	%Growth in Imports	0.504909	23	%Growth in Imports	0.0097443	0.0143848	0.6774	0.504909
				intercept	6.29588	0.470295	13.3871	< 0.0001

Fig 16: Model statistics of GDP growth of India predicted by Imports growth from China to India.

In the above model, GDP growth of India is dependent variable and Growth of Imports from China to India is independent variable. Here, we can observe that the R squared value is very low, that is 0.019, coupled with insignificant p-value of 0.50, indicating that the Imports growth from China to India does not contribute much significantly to the GDP growth of India.

Therefore, a large and significant portion of India’s GDP growth does not come from import from China to India.

Now analysing the above model while changing the variables, that is, taking GDP growth of India as independent variable and Growth of Imports from China to India as dependent variable. The details of the model are given below:

Model formula: (India GDP growth (annual %) + intercept)

Number of modeled observations: 25

Number of filtered observations: 0

Model degrees of freedom: 2

Residual degrees of freedom (DF): 23

SSE (sum squared error): 14485.2

MSE (mean squared error): 629.793

R-Squared: 0.0195607

Standard error: 25.0957

p-value (significance): 0.504909

Individual trend lines:

Panels		Line	Coefficients					
Row	Column	p-value	DF	Term	Value	StdErr	t-value	p-value
%Growth in Imports	India GDP growth (annual %)	0.504909	23	India GDP growth (annual %)	2.0074	2.96339	0.6774	0.504909
				intercept	8.79543	19.9308	0.441299	0.663117

Fig 17: Model statistics of Imports growth from China to India predicted by GDP growth of India.

In the above model, we are predicting the Growth in Imports from China to India with the help of GDP growth of India. Here, we can observe that the R squared value is very low, that is 0.019, coupled with insignificant p-value of 0.50, indicating that the GDP growth of India does not contribute much significantly to the Imports growth from China to India.

Therefore, on the basis of both the models, we can conclude that **there is no significant relationship between GDP growth of India and Growth of Imports from China to India.**

Now applying Granger Causality Tests to confirm if there is causal relationship between the two variables, that is, GDP growth of India and Growth in Imports from China to India.

Pairwise Granger Causality Tests
 Date: 02/15/21 Time: 20:25
 Sample: 1995 2019
 Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INDIA_GDP_GROWTH__ANNUAL__ does not Granger Cause _GROWTH_IN_IMPORTS	23	4.64413	0.0236
_GROWTH_IN_IMPORTS does not Granger Cause INDIA_GDP_GROWTH__ANNUAL__		0.72254	0.4991

Fig 18: Granger Causality test between Imports growth from China to India and GDP growth of India.

From the above results of Granger Causality test, we can observe that in case of first hypothesis, the F-statistic is high and the p-value is significant (lower than 0.05), so we can reject the null hypothesis.

Therefore, we can say that GDP growth of India causes the Growth of Imports from China to India. This may be because as the GDP of the country increases, the per capita income also increases, leading to more consumption in the economy, thereby more demand for Chinese imports as they are cheaper in many products.

However, in case of second hypothesis, the F-statistic is low and the p-value is insignificant (higher than 0.05), so we cannot reject the null hypothesis.

Therefore, we can say that Growth of Imports from China to India does not causes GDP growth of India.

We have drawn a best fit line for the points on the graph. The slope of line can be observed to be small, indicating that there is weak relationship between the GDP growth of China and the Imports growth from China to India.

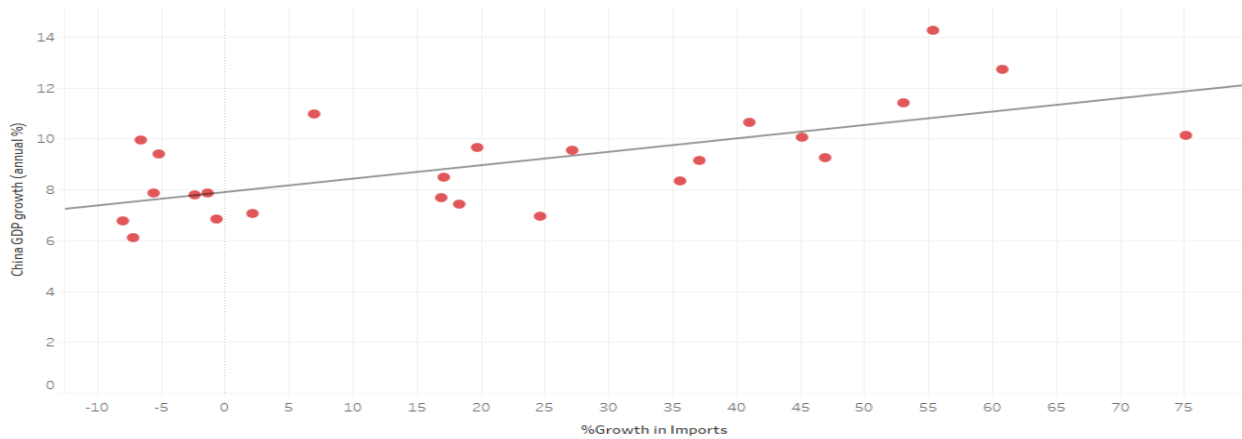


Fig 19: Scatter plot between GDP growth of China and Growth of Imports from China to India.

The details of the linear model is given below:

Model formula: (%Growth in Imports + intercept)

Number of modeled observations: 25
Number of filtered observations: 0
Model degrees of freedom: 2
Residual degrees of freedom (DF): 23
SSE (sum squared error): 51.6759
MSE (mean squared error): 2.24678
R-Squared: 0.442712
Standard error: 1.49893
p-value (significance): 0.0002841

Individual trend lines:

Panes	Line	Coefficients						
Row	Column	p-value	DF	Term	Value	StdErr	t-value	p-value
China GDP growth (annual %)	%Growth in Imports	0.0002841	23	%Growth in Imports	0.0527123	0.0123318	4.27449	0.0002841
				intercept	7.89033	0.403176	19.5704	< 0.0001

Fig 20: Model statistics of GDP growth of China predicted by Importsgrowth from China to India.

In the above model, GDP growth of China is dependent variable and Growth of Imports from China to India is independent variable. Here, we can observe that the R squared value is very high, that is 0.44, coupled with highly significant p-value of 0.00028, indicating that the Imports growth from China to India does contribute significantly to the GDP growth of China. That is for every 1% rise in the Growth of Imports from China to India, the GDP of China grows by 5.2%. The model’s R square value indicates that the Growth of Imports from China to India explains 44% of the Growth in GDP of China.

Therefore, a large and significant portion of China’s GDP growth comes from imports from China to India.

Now analysing the above model while changing the variables, that is taking GDP growth of China as independent variable and Growth of Exports from India to China as dependent variable. The details of the model are given below:

Model formula: (China GDP growth (annual %) + intercept)
Number of modeled observations: 25
Number of filtered observations: 0
Model degrees of freedom: 2
Residual degrees of freedom (DF): 23
SSE (sum squared error): 8233.51
MSE (mean squared error): 357.979
R-Squared: 0.442712
Standard error: 18.9203
p-value (significance): 0.0002841

Individual trend lines:

Panels		Line	Coefficients					
Row	Column	p-value	DF	Term	Value	StdErr	t-value	p-value
%Growth in Imports	China GDP growth (annual %)	0.0002841	23	China GDP growth (annual %)	8.39864	1.96483	4.27449	0.0002841
				intercept	-54.0849	18.1658	-2.97729	0.0067399

Fig 21: Model statistics of Imports growth from China to China predicted by GDP growth of China.

In the above model, we are predicting the Growth in imports from China to India with the help of GDP growth of China. Here, we can observe that the R squared value is high, that is 0.44, coupled with significant p-value of 0.0002, indicating that the GDP growth of China contributes significantly to the Imports growth from China to India.

Therefore, on the basis of both the models, we can conclude that **there is a significant relationship between GDP growth of China and Growth of Imports from China to India.**

Now applying Granger Causality Tests to confirm if there is causal relationship between the two variables, that is, GDP growth of China and Growth in Imports from China to India.

Pairwise Granger Causality Tests
 Date: 02/15/21 Time: 20:47
 Sample: 1995 2019
 Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CHINA_GDP_GROWTH__ANNUAL__ does not Granger Cause _GROWTH_IN_IMPORTS	23	3.08144	0.0707
_GROWTH_IN_IMPORTS does not Granger Cause CHINA_GDP_GROWTH__ANNUAL__		1.45508	0.2596

Fig 22: Granger Causality test between Imports growth from China to India and GDP growth of China.

From the above results of Granger Causality test, we can observe that in case of first hypothesis, the F-statistic is high and the p-value is significant (lower than 0.05), so we can reject the null hypothesis.

Therefore, we can say that GDP growth of China causes the growth of Imports from China to India.

Also in case of second hypothesis, we can observe that the F-statistic is very low and the p-value is insignificant (much greater than 0.05), so we cannot reject the second null hypothesis.

Therefore, we can say that Growth of imports from China to India does not causes the growth of Imports from China to India.

CHAPTER FIVE

FINDINGS

- **A large and significant portion of India's GDP growth does not come from export with China.** The possible reason is, since the share of exports from India to China compared with the total exports has stagnated from 2004, therefore the growth of exports from India to China does not impact the GDP growth of India.
- There is no significant relationship between GDP growth of India and Growth of Exports from India to China. Also, there is no causal relationship between Growth of Exports from India to China and the GDP growth of India. **Therefore, Growth in Exports from India to China does not cause the GDP growth of India.**
- **A large and significant portion of China's GDP growth does not come from exports from India to China.** The possible reason is, since the export from India to China is very small as compared to overall trade of China with the world, therefore, the growth of exports from India to China will not impact the GDP growth of China to a greater extent.
- There is no significant relationship between GDP growth of China and Growth of Exports from India to China. Also, there is no causal relationship between Growth of Exports from India to China and the GDP growth of China. **Therefore, Growth in Exports from India to China does not cause the GDP growth of China.**
- **A large and significant portion of India's GDP growth does not come from import from China to India.** The possible reason is, since the increased imports from China challenges the domestic industries in India more than benefits to the consumers, therefore the growth in imports from China to India does not impact the GDP growth of India.
- There is no significant relationship between GDP growth of India and Growth of Imports from China to India. Also, there is no causal relationship between Growth of Imports from China to India and the GDP growth of India. **Therefore, Growth of Imports from China to India does not cause the GDP growth of India.**
- **A large and significant portion of China's GDP growth comes from imports from China to India.** The possible reason is, since the export from China to India is large and India is an attractive market for Chinese exports, therefore, the growth of Imports from China to India will positively impact the GDP growth of China.
- There is a significant relationship between GDP growth of China and Growth of Imports from China to India. However, there is no causal relationship between Growth of Imports from China to India and the GDP growth of India. **Therefore, Growth of Imports from China to India does not cause the GDP growth of India.** But the relation becomes causal in 92% or lesser confidence interval but not at 95% confidence interval.

CHAPTER SIX CONCLUSION

As per the findings of this research project on ANALYSIS OF INDIA-CHINA BILATERAL TRADE RELATIONS, we can conclude that the import and export with China does not hold a statistically significant relation with the GDP growth of India. However, the Export from China to India does hold a statistically significant relation with the GDP growth of India but not a causal one.

CHAPTER SEVEN

LIMITATIONS & FUTURE WORK

One of the major limitation of the study is that it only encompasses a time period of 25 years from 1995 to 2019. But we could not expand it further as India only adopted the Liberalization, Privatization and Globalization (LPG) reforms in 1991. So taking a time period beyond that would not have been appropriate for comparison.

Secondly, China had a very early head start in the trade liberalization process since 1980s while India initiated it in 1990s. This coupled with the form of political systems in both the nations has worked more in favour of China as the decision making and implementation is faster in China than India.

Lastly, even though the trade between India and China is highly skewed in favour of China but we also need to understand the fact that there are other synergies and dynamics of trade where India is also taking the advantage.

For example, the success story of the Indian pharma sector is not hidden from anyone. India is currently the largest provider of generic drugs globally. Indian pharmaceutical sector industry supplies over 50 per cent of global demand for various vaccines, 40 per cent of generic demand in the US and 25 per cent of all medicine in UK. But only a few know that Indian drugmakers import around 70 per cent of their total bulk drugs from China.

The automobile market, especially 2-wheelers company like Bajaj and TVS, which exports to more than 70 and 60 countries respectively import various crucial parts from China. Even our evolving agrochemicals market, which exports more than 50% of its production from China.

So we need to consider other aspects as well.

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