An Empirical Analysis of India–USA Bilateral Trade Relation: Comparative Advantage and Complementarity Approach

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Abstract: The basic motive of the research paper is to study bilateral trade relation between India and USA using the Revealed Comparative Advantages Index and Trade Complementarity Index for the period 2011 to 2016. The study revealed that India enjoys comparative advantages in 9 items out of 20 major categorised items based on 2 digits HS Code in its trade composition whereas in case of USA only 8 items enjoys comparative advantages. Further, it has been seen that among 20 major items, one country having comparative advantages for some items but another country has comparative disadvantages for the same items, it signifies the good bilateral trade relation and trade dependence of both the countries. The Complementarity Index of both the countries indicates that export supply of India and USA partially matched with the import demand of USA and India respectively; Indices of India is being continuously decreased but for the USA it is being continuously increased during the research period 2011 to 2016. It implies that India may have better trade potential with USA by diversifying its trade structures to USA.

Keywords: India, USA, Bilateral Trade, Revealed Comparative Advantages, Trade Complementarity Index

Introduction

India and United States of America have mutual economic interests that are longstanding and growing under "Global Strategic Partnership". In this partnership, trade is the significant tools to maintain and improve the economic relationship between both the countries. Trade plays its significant role in transforming the India-USA relation as bilateral trade has much improved in last two decades from $45 billion in 2006 to $114 billion in 2016. In 2014, "President Obama and Prime Minister Narendra Modi pledged to increase U.S.–India trade fivefold, and in the past two years, U.S. foreign direct investment in India has grown 500 percent. However, U.S.–India trade remains far short of its full potential"[1]. USA might be considerd as one of the most important trade partner for India as it is continuously paced at top export market and second top import market for India after China; Recently, 10.11% of total trade of India recorded with USA, whereas India was the 18th largest export market for USA for 18.8% of its total export in 2016. The major items in the composition of India's export to USA are Live Animal & Animal Products, Vegetable Products, Minerals, Chemical Products, Leather & Allied items, Textiles, Footwear & Headgear, Gems & Jewellery and Engineering Goods; whereas major items in the composition of USA's export to India are Vegetable Products, Chemical Products, Plastic & Rubber, Pulp & Paper Board, Gems & Jewellery, Machinery, Transport Equipments and Optical Photographic Surgical & Musical Instruments etc. Thus, it signifies the better bilateral trade relation between both the countries and there is greater scope to find the measures to improve their bilateral trade relation.

Literature Review

Literatures related with present topic are very limited however there are various literature available on bilateral trade of with other economies which provides motivation for study of present topic and trade analysis tools used in that study. Some selected literatures are as under:

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[1] https://www.nationalreview.com/2018/02/india-united-states-relations-trade-military-strategy-alliance/

A Practical Guide to Trade Policy Analysis available at WTO website comprises of various econometrics tools to study the bilateral trade provides fundamental understanding in analyzing the bilateral relation between two economies. **Kabiru Hannafi Ibrahim and Abdulaziz Shehu (2016),** in their research paper namely "Nigeria – India Bilateral Trade Relation: An Analysis of Trade Complementarity Index (TCI)" examines the trade relation between Nigeria & India with the help of Complementarity Index and concluded that Nigeria's export supply to India's import demand is being partially matched during the period 2000 to 2014. **Faridul Islam, Aviral Kumar Tiwari & Muhammad Shahbaz (2018),** in their research paper namely "Indo-US Bilateral Trade: An Empirical Analysis of India's Trade Balance", examining the impact of India's exchange rate vs. the US dollar on India's trade balance by applying specific econometric tools and concluded that in the long run, the impact of lagged trade balance and exchange rate is positive and highly significant on the India's trade balance while impact of money supply is negative and significant. **Xioling Kang & Ying Zhang (2015**), in their research paper analyzed the Sino-India trade relation to know the Complementarity & potentiality between both the counties by employing Trade Intensity Indices, Revealed Comparative Advantages Indices, Trade Complimetarity Indices, Trade Specialization Indices and Gravity Model, consequently, concluded that Complementarity and competitiveness co-exist in the field of trade and greater potentiality also exist between both the countries.

Objectives

1. To examined The Competitive Advantages of India & USA in World Trade.
2. To find out the Trade Potential between India & USA bilateral trade by employing trade Complementarity index (TCI).

Research Methodology

The present study is analytical in nature and cover the period of 6 years (2011 to 2016). The data used in the study (based on two digit HS code) are secondary in nature and collected from International Trade Centre, UNCOMTRADE and International Trade Statistics, WTO etc. This study attempts to analyze the India-USA Bilateral Trade Relation empirically with the help of Revealed Comparative Advantage Index and Trade Complementarity Index.

Revealed Comparative Advantage (RCA) Index, originally proposed by Balassa (1965), is used in international economics to calculate the relative advantages and disadvantages of a certain economy in certain categories of goods or services. It is the ratio of two shares in which numerator is the share of a country's particular commodity in its total exports to world whereas denominator is the share of world exports of the same commodity in world total exports. In the present study, RCA Indices for both the country (India and USA) have been measured.

$$RCA = \frac{X_{ij}/X_{it}}{W_j/W_t}$$

Where,
X_{ij} = Country i (India/USA) Export of commodity j to world
X_{it} = Country i (India/USA) Total Export to world
W_j = World Export of Commodity j
W_t = World Total Export

RCA Indices take the value between 0 to ∞. A comparative advantage is 'revealed' if RCA>1 means a country is said to have a comparative advantage in particular commodity or industry whereas comparative disadvantage is 'revealed' if RCA<1 means a country is said to have a comparative disadvantage in particular commodity or industry in the world.

Further, to assess trade potential between India and USA, Trade Complementarity Index (Introduced by Michaely, 1996) has been employed in the present study. It is used to measure the extent to which two countries are 'natural trading partner' in the sense that what one country exports overlaps with what the other country imports. In other words, if the composition of India's export supply matched with the composition of USA's Import demand the Complementarity exists and there would be better trade potential for India. If there is mis-match, it would be considered as absence of Complementarity with poor trade potential for India. In the present study, TCI has been employed for both the countries (India and USA).

$$TCI = 100\left[1 - \frac{\sum(|Mij - Xuj|)}{2}\right]$$

Where,

Mij = Share of commodity *j* in Country *i* (India/USA) total import from the world.

Xuj = Share of commodity *j* in Country *u* (USA/India) total export to the world.

Trade Complementarity Indices might also be considered as the measure of adequacy of India's/USA's export supply in meeting USA's/India's Import demand. It basically takes the value range from 0 to 100. There is perfect positive correlation if the value is 100 and perfect negative correlation if the value is 0.

Composition of India's bilateral trade with USA

USA might be considered as the one of the important trading partner for India as traditionally major trade portion of India's total trade associated with USA during the many previous years and recently 10.11% of total trade of India recorded with USA. Since USA is the second largest trading partner for India and India is the ninth largest trading partner for USA[2], which denotes existence of better bilateral trade relation between both countries. India was the 18th largest export market for USA for 18.8% of its total export with the value of $21.7 billion[3] , whereas USA was the top export market for India for 16.13% of its total export with the value of $41.9 billion in 2016[4]. In the export composition of India to USA, major items have been shown in figure 1 for the year 2016. Top 5 items in India's export to USA in 2016 are Gems & Jewellery (23.64%, $9925.48 million), Chemical Products (18.45%, $7746.07 million), Textiles (17.95%, $7539.73 million), Engineering Goods (5.21%, $2188.88 million) and Minerals (4.85%, $2036.72 million).

Commodities	2016	
	Value US $Million	Share %
Live Animal & Animal Products	1522.95	3.63
Vegetable Products	1317.96	3.14
Vegetable Oils	84.35	0.20
Prepared Foods & Tobacco	602.70	1.44
Minerals	2036.72	4.85
Chemical Products	7746.07	18.45
Plastic and Rubber	964.73	2.30

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[2] https://en.wikipedia.org/wiki/India%E2%80%93United_States_relations#Economic_relations

[3] https://www.usispf.org/us-india-trade

[4] ITC calculations based on UN COMTRADE statistics

Leather & Allied Items	485.96	1.16
Wood & Articles Thereof	155.91	0.37
Pulp & Paper Board	138.60	0.33
Textiles	7539.73	17.95
Footwear & Headgear	486.12	1.16
Mica, Ceramic, Glass & Glassware	591.78	1.41
Gems & Jewellery	9925.48	23.64
Engineering Goods	2188.88	5.21
Machinery	1887.71	4.50
Electronic Goods	1170.36	2.79
Transport Equipments	1876.41	4.47
Optical, Photographic, Surgical & Musical Instruments	424.64	1.01
Misc. Manufactured Items	696.06	1.66
Other Commodities	149.35	0.36

Figure 1: India's Export to USA

2016
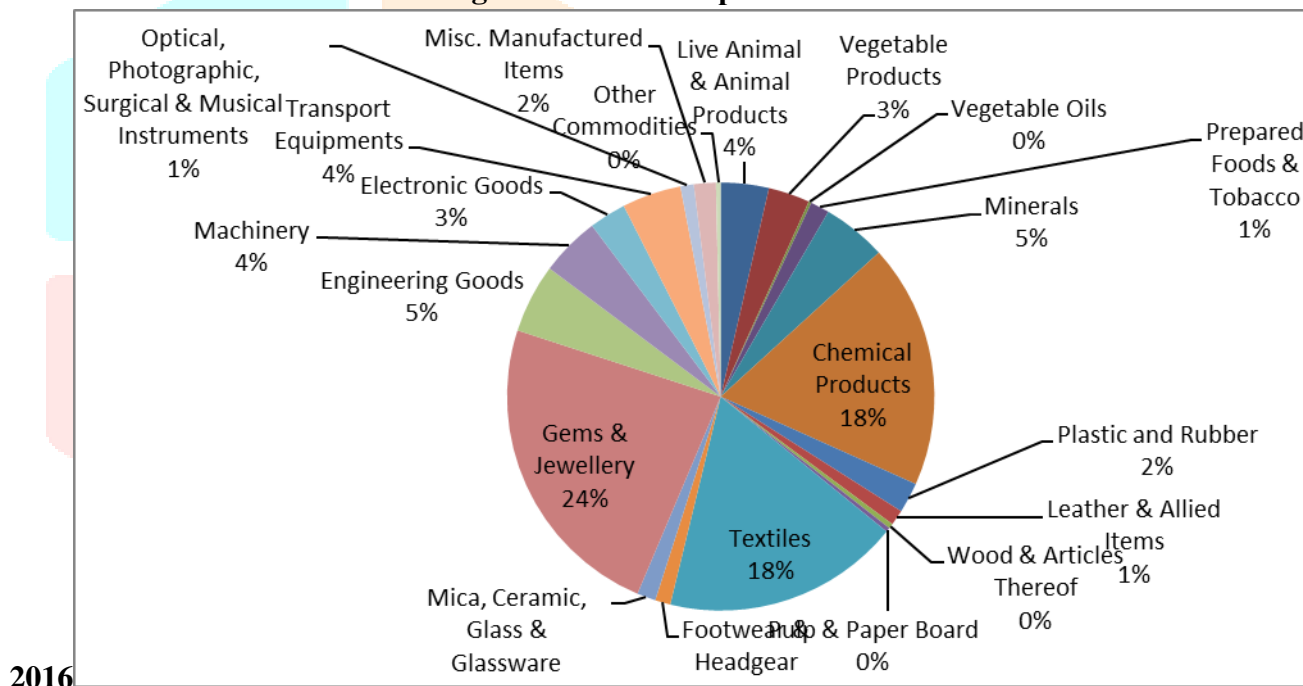
Source: Data Compiled by Author from ITC calculations based on UN COMTRADE statistics

So far as the import is concern, India was the 9th largest supplier of USA for 2.11% of its total import with the value of $46 billion[5], whereas USA was the 2nd largest supplier of India after China for 5.72% of its total import for the value of $20.39 billion in 2016[6]. In the import composition of India from USA, major items have shown in figure 2 for the year 2016. Top 5 items in India's import from USA are Machinery (19.46%, $3969.50 million), Chemical Products (14.64%, $2985.13 million), Gems & Jewellery (9.75%, $1988.94 million), Transport Equipments (8.57%, $1746.87) and Electronic Goods (8.40%, $1713.17 million).

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[5] https://www.usispf.org/us-india-trade

[6] ITC calculations based on UN COMTRADE statistics

Commodities	2016	
	Value US $Million	Share %
Live Animal & Animal Products	37.00	0.18
Vegetable Products	861.69	4.22
Vegetable Oils	6.70	0.03
Prepared Foods & Tobacco	266.93	1.31
Minerals	1408.06	6.90
Chemical Products	2985.13	14.64
Plastic and Rubber	1100.30	5.39
Leather & Allied Items	17.62	0.09
Wood & Articles Thereof	32.98	0.16
Pulp & Paper Board	781.46	3.83
Textiles	422.49	2.07
Footwear & Headgear	3.96	0.02
Mica, Ceramic, Glass & Glassware	187.64	0.92
Gems & Jewellery	1988.94	9.75
Engineering Goods	1073.74	5.26
Machinery	3969.50	19.46
Electronic Goods	1713.17	8.40
Transport Equipments	1746.87	8.57
Optical, Photographic, Surgical & Musical Instruments	1443.00	7.08
Misc. Manufactured Items	87.37	0.43
Other Commodities	260.69	1.28

Figure 2: India's Import from USA

2016

Source: Data Compiled by Author from ITC calculations based on UN COMTRADE statistics

Analysis of Revealed Comparative Advantage Index
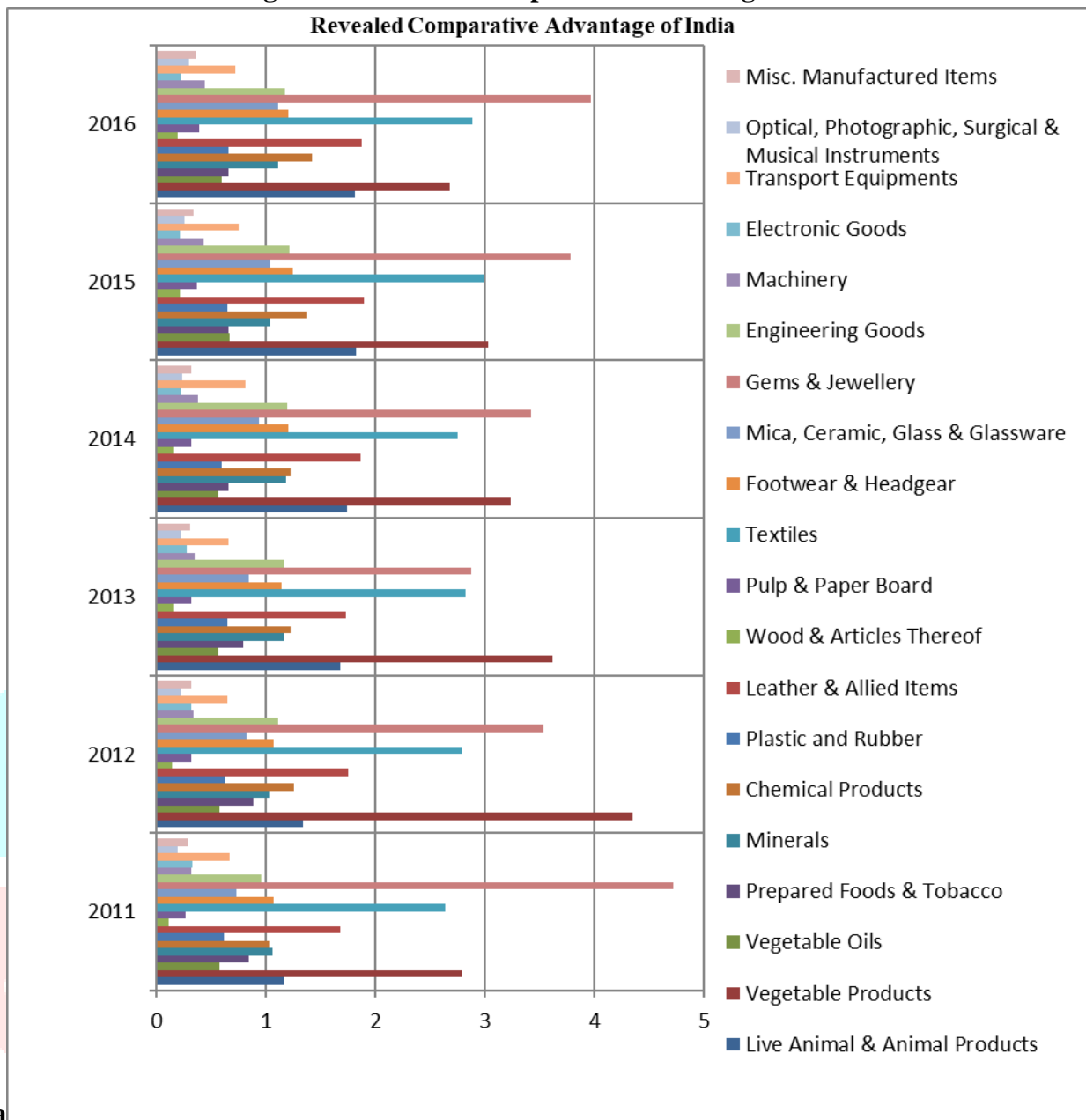
Revealed Comparative Advantage of India

Revealed Comparative Advantage Indices of India in world have been presented in table 1 and figure 3 respectively on the basis of two digit HS code (further categorised in 20 major items) data collected from ITC calculation based on UNCOMTRADE from 2011 to 2016. From among 20 items India enjoy revealed comparative advantages in 9 items (Live Animal & Animal Products, Vegetable Products, Minerals, Chemical Products, Leather & Allied items, Textiles, Footwear & Headgear, Gems & Jewellery and Engineering Goods) as the indices are greater than unity and comparative disadvantage in remaining 11 items as the indices are lesser than unity. In 9 items having comparative advantages for India, Gems & Jewellery recorded the highest Index value 4.72 in 2011 reduced to 2.87 in 2013 but further maintaining the value at 3.97 in 2016. Vegetable Products may be considered as second items having better comparative advantages for India with the index value of 2.79 in 2011 increased to 4.35 in 2012 but continuously being decreased in the following years. The next item in sequence to comparative advantages is Textiles with the index value of 2.64 in 2011 and consistent at the index value of more than 2 in the following years. Remaining items in the sequence to having comparative advantages like Live Animals & Animal Product, Minerals, Chemical Products, Leather & Allied Items and Footwear & Headgear have index value more than 1 but less than 2 during the study period 2011 to 2016 except Engineering Goods which has the index value less than 1 in the year 2011.

Table 1: Revealed Comparative Advantage of India

Commodities	2011	2012	2013	2014	2015	2016
Live Animal & Animal Products	1.16	1.34	1.68	1.74	1.82	1.81
Vegetable Products	2.79	4.35	3.62	3.23	3.03	2.68
Vegetable Oils	0.57	0.57	0.56	0.56	0.67	0.59
Prepared Foods & Tobacco	0.84	0.88	0.79	0.66	0.66	0.66
Minerals	1.06	1.03	1.16	1.18	1.04	1.11
Chemical Products	1.03	1.25	1.22	1.22	1.37	1.42
Plastic and Rubber	0.61	0.62	0.64	0.59	0.64	0.66
Leather & Allied Items	1.68	1.75	1.73	1.86	1.89	1.87
Wood & Articles Thereof	0.11	0.14	0.15	0.15	0.21	0.19
Pulp & Paper Board	0.26	0.32	0.32	0.32	0.37	0.39
Textiles	2.64	2.79	2.82	2.75	2.99	2.88
Footwear & Headgear	1.07	1.07	1.14	1.20	1.24	1.20
Mica, Ceramic, Glass & Glassware	0.73	0.82	0.84	0.93	1.04	1.11
Gems & Jewellery	4.72	3.53	2.87	3.42	3.78	3.97
Engineering Goods	0.95	1.11	1.16	1.19	1.21	1.17
Machinery	0.31	0.34	0.35	0.38	0.43	0.44
Electronic Goods	0.33	0.32	0.27	0.22	0.21	0.22
Transport Equipments	0.67	0.64	0.66	0.81	0.75	0.72
Optical, Photographic, Surgical & Musical Instruments	0.19	0.22	0.22	0.23	0.25	0.29
Misc. Manufactured Items	0.28	0.31	0.30	0.31	0.34	0.36

Source: Data Compiled by Author from ITC calculations based on UN COMTRADE statistics

Figure 3: Revealed Comparative Advantage of

Source: Table 1

Revealed Comparative Advantage of USA

Revealed Comparative Advantage Indices of USA in world have been presented in table 2 and figure 4 respectively on the basis of two digits HS Code (further categorised in 20 major items) data collected from ITC calculation based on UNCOMTRADE from 2011 to 2016. From among 20 items USA enjoy revealed comparative advantages in almost 8 items (Vegetable Products, Chemical Products, Plastic & Rubber, Pulp & Paper Board, Gems & Jewellery, Machinery, Transport Equipments and Optical Photographic Surgical & Musical Instruments) as the indices are greater than unity and comparative disadvantage in remaining 12 items as the indices are lesser than unity. In 8 items having Comparative advantages for USA, Vegetable Products recorded the highest index value of 1.86 in 2011 during the period 2011-2016 among other items which further showing decreasing trends except in 2014 with the value of 1.75 to the value of 1.64 in 2016. Live Animal & Animal Product is the item which being shown comparative advantage only in the year 2012 (except 8 items above mentioned) with the index value of 1.00 and for remaining years it was close to unity value. Optical Photographic Surgical & Musical Instruments is the second items having better comparative advantage after Vegetable Product indicate the index value of 1.70 in 2011, further showing reducing trend in following years to the index value of 1.56 in 2016. Gems & Jewellery which constitute the major share in export of USA to India, recorded the index value of 1.38, 1.11, 1.05 and 1.00 in the year 2011, 2012, 2014

and 2015 respectively showing revealed comparative advantage but in the year 2013 and 2016 the index value was only closer to unity showing revealed comparative disadvantage. Remaining items like Chemical Products, Plastic & Rubber, Pulp & Paper Board, Machinery and Transport equipments are indicated the index value more than unity in all years during the study period 2011 to 2016 and hence showing comparative advantages in all these years.

Table 2: Revealed Comparative Advantage of USA

Commodities	2011	2012	2013	2014	2015	2016
Live Animal & Animal Products	0.99	1.00	0.98	0.96	0.88	0.86
Vegetable Products	1.86	1.81	1.70	1.75	1.55	1.64
Vegetable Oils	0.55	0.52	0.46	0.41	0.40	0.40
Prepared Foods & Tobacco	0.89	0.89	0.93	0.92	0.92	0.89
Minerals	0.48	0.48	0.53	0.59	0.62	0.66
Chemical Products	1.24	1.22	1.21	1.17	1.18	1.17
Plastic and Rubber	1.13	1.12	1.12	1.11	1.12	1.10
Leather & Allied Items	0.57	0.57	0.58	0.56	0.51	0.49
Wood & Articles Thereof	0.79	0.77	0.80	0.80	0.76	0.76
Pulp & Paper Board	1.38	1.45	1.40	1.34	1.34	1.32
Textiles	0.46	0.42	0.40	0.37	0.35	0.34
Footwear & Headgear	0.15	0.15	0.14	0.13	0.14	0.13
Mica, Ceramic, Glass & Glassware	0.78	0.75	0.74	0.73	0.72	0.75
Gems & Jewellery	1.38	1.11	0.99	1.05	1.00	0.97
Engineering Goods	0.74	0.78	0.77	0.72	0.69	0.69
Machinery	1.22	1.24	1.22	1.19	1.17	1.11
Electronic Goods	0.91	0.89	0.86	0.84	0.80	0.80
Transport Equipments	1.48	1.62	1.65	1.65	1.59	1.59
Optical, Photographic, Surgical & Musical Instruments	1.70	1.66	1.66	1.59	1.55	1.56
Misc. Manufactured Items	0.71	0.69	0.66	0.63	0.58	0.57

Source: Data Compiled by Author from ITC calculations based on UN COMTRADE statistics

Figure 4: Revealed Comparative Advantage of
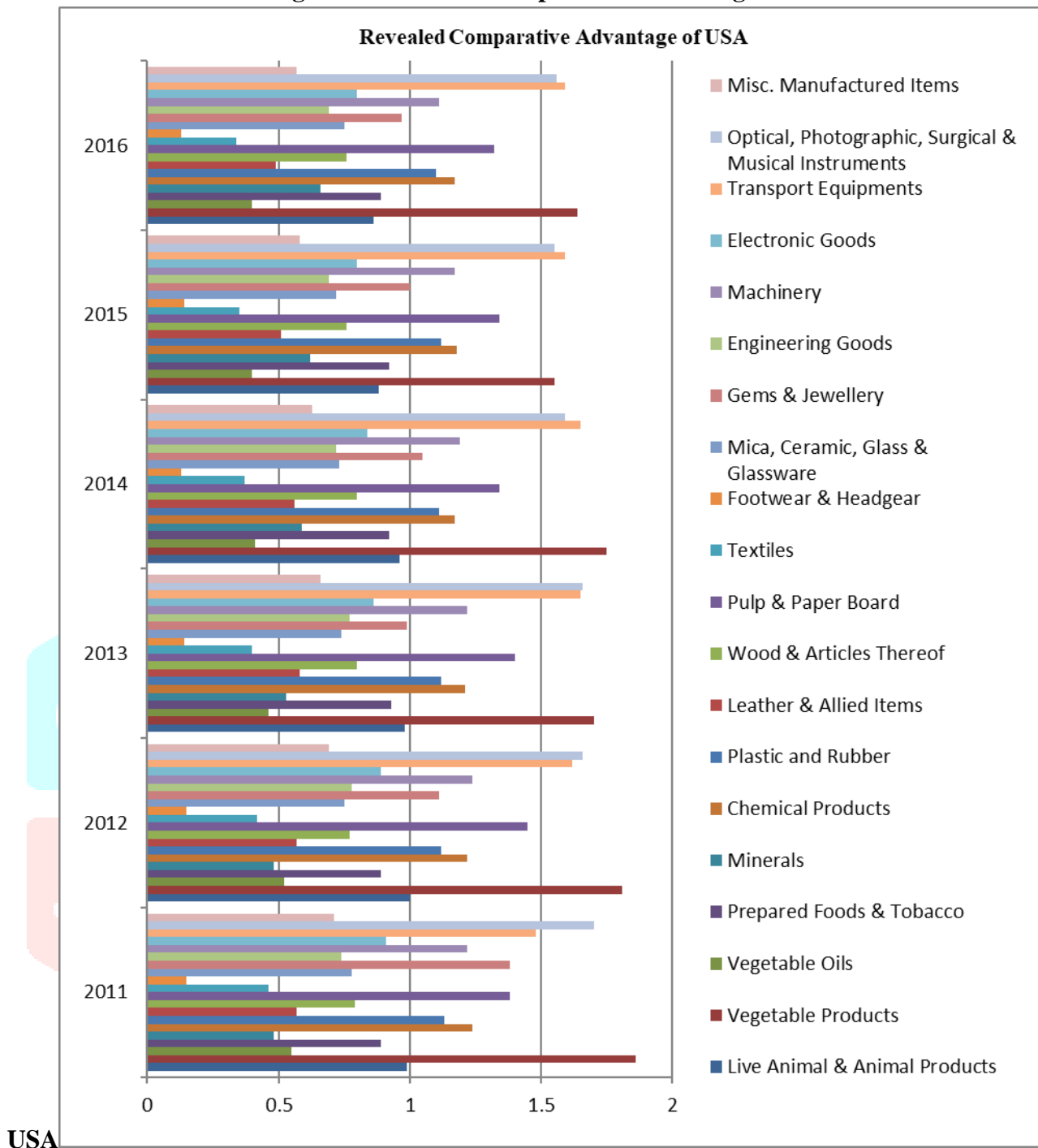
Source: Table 2

Analysis of Trade Complementarity Index

Trade Complementarity Indices have been presented in the table 3 for India and USA for the period of 2011 to 2016 on the basis of 2 digits HS Code data collected from ITC calculation based on UNCOMTRADE for 20 major categorised items in composition of trade of both the countries. During the period 2011 to 2016, India's export supply seems to be partially matched with USA import demand as the indices lies in the range of 0 to 100. In 2011, India has the highest Complementarity to USA with the value 70.49 which is further being remarkably decreased in the following years to the value in 2016 at 60.53. This implies that higher the value of Indices near 100, higher the adequacy of India's export supply in meeting the USA's import demands. Analysis of Complementarity indices reveals that India is able to meet major import demand of USA from its available export supply; this is possible because of the major share of Gems & Jewellery, Chemical Products, Textiles, Engineering Goods and Minerals etc. in India's export to USA. In 2011, Index

is 70.49 implying that India was only capable of meeting 70.49% of USA's import demand towards India which remarkably decreased to 60.53% in the year 2016; this indicates that India's export supply is becoming less compatible to USA's import demand due to changes in trade profile of India.

During the period 2011 to 2016, export supply of USA also seems to be partially matched with the demand of India's import as the indices lies in range of 0 to 100. In 2011, USA has the lowest Complementarity to India with the value of 56.23, which is further being remarkably increased in the following years to the value in 2016 at 66.00. This implies that adequacy of USA's export supply has been improved in meeting the import demand of India as the indices are continuously improved during this period. Theses Complementarity is the result of major share of Vegetable Products, Chemical Products, Plastic and Rubber, Pulp & Paper Board, Gems & Jewellery, Machinery, Transport Equipments, Optical Photographic Surgical & Musical Instruments etc. having the revealed comparative advantage in USA's trade composition. In 2011, Index is 56.23   implying that USA was only capable of meeting 56.23% of India's import demand toward USA which remarkably improved to 66% in the year 2016; this indicates that USA's export supply is becoming more compatible to India's import demand.

Table 3: Trade Complementarity Index

Year	India's Trade Complementarity Index with USA	USA's Trade Complementarity Index with India
2011	70.49	56.23
2012	65.97	55.16
2013	64.47	56.32
2014	63.99	57.44
2015	61.31	62.44
2016	60.53	66.00

Source: Data Compiled by Author from ITC calculations based on UN COMTRADE statistics

Figure 4 illustrates the trade complimetnatrity Indices for India and USA. The indices of India to USA are continuously decreasing from 2011 to 2016; implied that India's export supply is being less compatible to USA's import demand. Indices for USA to India are continuously increasing from 2011 to 2016; implied that USA's export supply is being more compatible to India's import demand. At comparison between both the countries, where India's Complementarity to USA is being continuously decreased, USA's Complementarity to India is being increased during the period. It implies that India may have better trade potential in future years by diversifying its export structure to USA.

Figure 4: Trade Complementarity Indices of India and
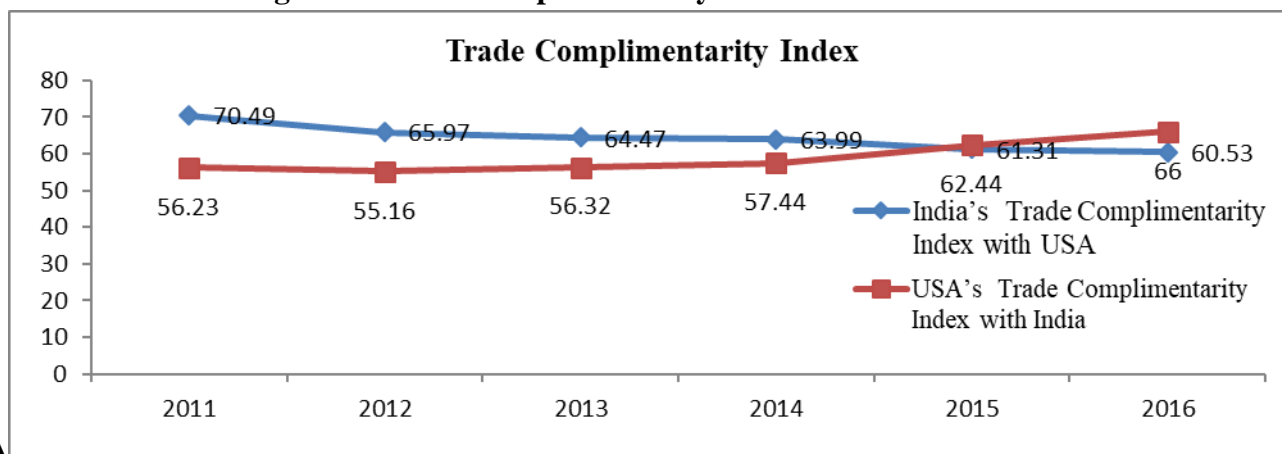
Source: Table 3

Conclusion

From the above discussion it is very much clear that India and USA are natural allies as they share lot of common interests including trade, economy, investment, energy, defence cooperation, health, science & technology, climate change and education etc. But in all these, trade specifically has significant role in maintaining the overall relation between India and USA. For conclusion, it has been revealed that India enjoys comparative advantages in 9 items (Live Animal & Animal Products, Vegetable Products, Minerals, Chemical Products, Leather & Allied items, Textiles, Footwear & Headgear, Gems & Jewellery and Engineering Goods) as the indices are greater than unity and comparative disadvantage in remaining 11 items as the indices are lesser than unity; whereas USA enjoys comparative advantages in almost 8 items (Vegetable Products, Chemical Products, Plastic & Rubber, Pulp & Paper Board, Gems & Jewellery, Machinery, Transport Equipments and Optical Photographic Surgical & Musical Instruments). It implies that both the counties have the better trade potential against each other as some of the commodity in India's export which has comparative advantages, hold the comparative disadvantages is USA's export like Live Animal & Animal Products, Leather & Allied items, Textiles, Footwear & Headgear, and Engineering goods etc. holds comparative advantages for India whereas comparative disadvantages for USA. By analysis of trade Complementarity index, it revealed that export supply of India and USA partially matched with the import demand of USA and India respectively. During the study period, it has been seen that India's Complementarity to USA is being decreased continuously whereas USA's Complementarity to India is being increased; which denotes that India may have better trade potential by diversifying trade composition to USA.

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