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**Dynamics of Comparative Advantage and
Competitiveness of Textile and Apparel
Industry: An Empirical Analysis for China and
Bangladesh**

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17 **ABSTRACT**
18

Aims: The purpose of this paper is to analyze the level of comparative advantage and competitiveness in Textile and Apparel (T&A) industry of Bangladesh and China in the global market. It also tries to link the competitiveness analysis with the trade theories of comparative advantage to synthesize different approaches of comparativeness

Place and Duration of Study: We used the two digit level of HS Code of 14 main products of Textile and Apparel industry over the period from 2000 to 2015. The existing database of Bangladesh Garment Manufacturers and Exporters Association (BGMEA), database of International Trade Center (ITC), and World Integrated Trade Solution (WITS) of World Bank were used to analyze the results.

Methodology: The proposed approach is based on the Balassa revealed comparative advantage (RCA) and Spearman Rank Correlation coefficient (r_s) to examine the comparative advantage and competitiveness for the two digit level of HS Code of 14 main products of Textile and Apparel industry.

Results: The findings show that among the 14 products; Bangladesh improved her comparative advantage over 7 products, lowered over 5 products and remained quite unchanged over 2 products whereas China improved her comparative advantage over 8 products lowered over 2 products and remained quite unchanged over 4 products. According to the Competitiveness analysis of the 14 products; 3 products exist higher competition, 6 products exist modest competition and 5 products exist complementary between Bangladesh and China in global market. As a result, implications were discussed in this paper.

Conclusion: In this paper revealed comparative advantage has been analyzed at the two digit level of HS classification for both Bangladesh and China. The implications reveal that the three main stakeholders of T&A; the government, manufacturers, and buyers must work together to realize the potential of textile and apparel market for both Bangladesh and China. It is suggested for both countries to improve the industrial competitive advantage through human resource exploitation strategy and innovation in science and technology. Improving product and market diversification and reducing the lead time also suggested for improving the competitiveness of Bangladesh's T&A industry.

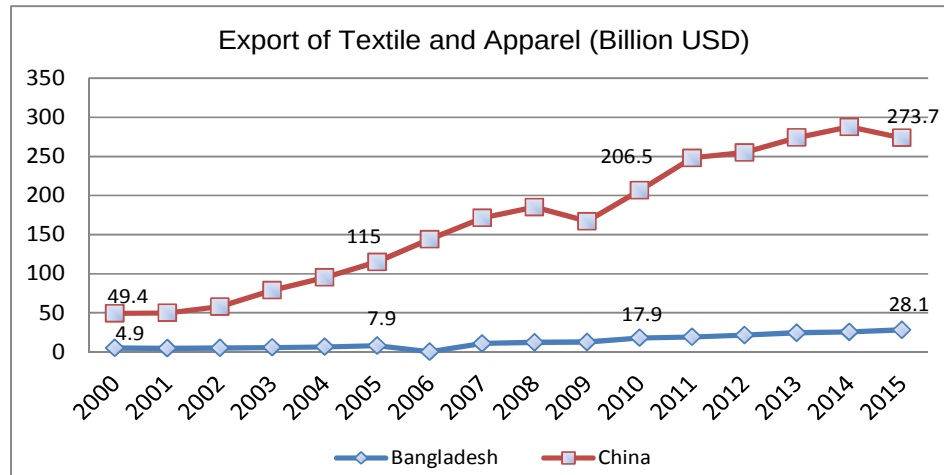
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20 *Keywords: Comparative Advantage; Competitiveness; Spearman Rank Correlation*
21 *Coefficient; Textiles and Apparel Industry; Bangladesh; China*

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23 *JEL Code: F12, F13, F14, O24*

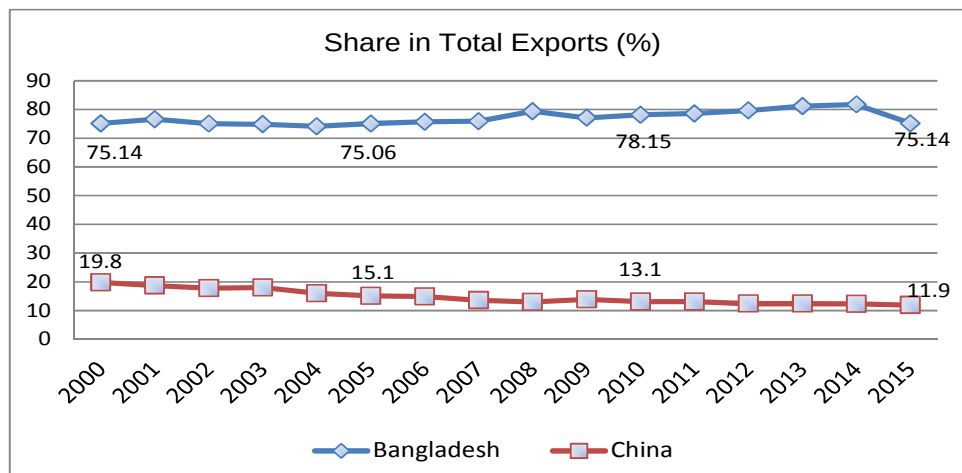
24 **1. INTRODUCTION**

25 Textile and Apparel (T&A) industry has long been an important component of international
26 trade and trade in this industry is conducted on an immense scale. Bangladesh's steady
27 growth for the past two decades and the average annual GDP growth more than 6 percent
28 over the last five years and the past decade's boom in exports particularly the T&A sector is
29 very significant to the country's economic growth (BGMEA, 2016); (BIDA, 2016); (Ara &
30 Rahman, 2009);(Ramesh Kurpad, 2014). The industry has been contributing to earnings
31 through export, creating employment for more than 4 million jobs, alleviating poverty and
32 women empowerment (BGMEA, 2016; (Haider, 2007); (Ramesh Kurpad, 2014). Among all
33 industries in China, T&A industry is among the earliest sectors to begin the marketization,
34 with strongest international competitiveness, fastest growth and most attention. At present,
35 in China around 6.7 million people working in T&A industry, among which more than 70%
36 are skilled and technical workers (CCCT, 2016), (Elloot, Huang, & Lehnich, 2013); (Gelb,
37 2005). In 2015, textile exports took up 11.99% of China's total exports and 31.5% of the
38 world's total exports in textile and apparel (CCCT, 2016);(ITC, 2016);(WITS, 2016). The
39 production and exports of Chinese textile products are the largest in the world. The

40 increasing consumption demand on apparel fuels the development of China's T&A industry.
 41 Qualified labor power, the world's 30% raw materials, complete industry chain, favorable
 42 investment environment and continuous reform on related policies and facilities are the
 43 preconditions of the development of Chinese T&A industry. Market-oriented reform has
 44 brought unprecedented vitality to Chinese T&A industry and China has 723 rapidly become
 45 the world's most dynamic apparel market. (Hossain, Dechun, & Tran, 2013); (Yuan, 2007).
 46 China's entry into the WTO in 2001 provided easier access to international market. Moreover
 47 2005's phasing out of quotas led to the rapid strengthening of the market share of the
 48 Chinese textile and clothing industries in the global market (Batra & Khan, 2005b); (Lau, To,
 49 Zhang, & Chen, 2009); (Karaalp & Yilmaz, 2013).

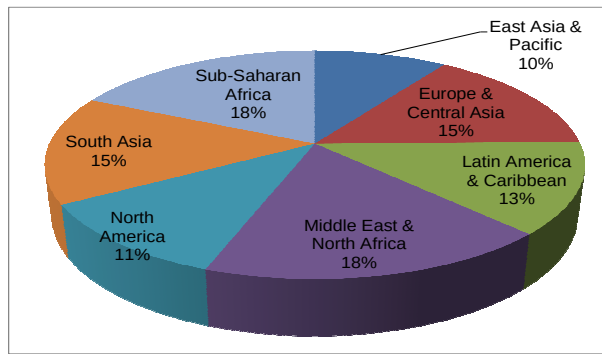


50 **Figure 1: Export Value of Textile and Apparel of Bangladesh and China in Billion US\$**
 51 Source: Bangladesh Garment Manufacturers and Exporters Association (BGMEA) and
 52 database of International Trade Center (ITC), and World Integrated Trade Solution (WITS) of
 53 World Bank compiled by the authors in November 2016
 54



55 **Figure 2: Share of Total Export of Textile and Apparel for Bangladesh and China**
 56 Source: Bangladesh Garment Manufacturers and Exporters Association (BGMEA) and
 57 database of International Trade Center (ITC), and World Integrated Trade Solution (WITS) of
 58 World Bank compiled by the authors in November 2016
 59

60 Figure 1 shows the trend of export of T&A for Bangladesh and China, likely the figure 2
 61 shows the trend of export of T&A products and share compare to total export of Bangladesh
 62 and China in last 16 years period, where Bangladesh's export in T&A become sevenfold and
 63 Chinese one become more than fivefold within the period of time (figure 1). But in terms of
 64 share in total export, Bangladesh's share stayed stable whereas Chinese share reduced
 65 significantly. This is because of the recent policy reform of Chinese T&A, moving from labor
 66 intensive readymade garments to high technology based production (Robin, Dunford, & Liu,
 67 2013); (Elout et al., 2013); (Lau et al., 2009).



68
 69 **Figure 3: Chinese T&A export to different region of the world in 2015**
 70 Source: World Integrated Trade Solution (WITS) database, compiled by the authors in
 71 November 2016

72 Figure 3 Shows the export destinations of Chinese T&A where Asian countries are the
 73 largest destination of export. Besides Asia, North American countries and European
 74 countries are the second largest export destination of Chinese T&A. On the contrary,
 75 European countries are the largest destination for Bangladesh's export of T&A (Figure 3)
 76 where the competition between two countries is immense. In the same, in North American
 77 countries are also the second largest export destination for Bangladesh's T&A and there
 78 also exist higher competition between two nations. Recent years Bangladesh could find
 79 some new non-traditional market for her export of T&A. In this regard, Australia, Brazil,
 80 Chile, China, India, Japan, Korea Rep., Mexico, Russia, South Africa and Turkey are the
 81 recent new potential markets for Bangladesh's T&A where the growth of export is quite
 82 significant (BGMEA, 2016; BIDA, 2016).

83 According to figure 4, the major export destination of Bangladesh's T&A is EU and Central
 84 Asian market likely, the North American market is the second largest market. East Asia and
 85 South America consists the third and fourth largest destination for the T&A export of
 86 Bangladesh.

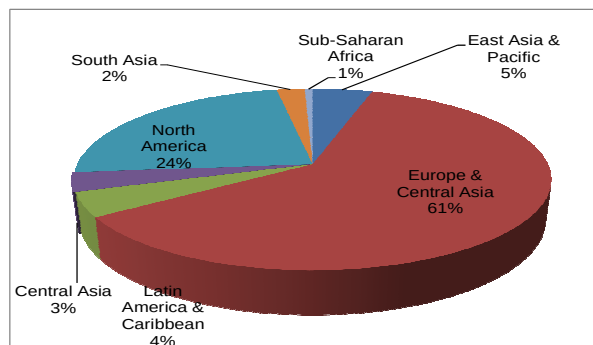


Figure 4 Bangladesh's Textile and Apparel exports by region in 2015

Source: Bangladesh Garment Manufacturers and Exporters Association (BGMEA) and database of International Trade Center (ITC), compiled by the authors in November 2016

According to the statistics provided by the World Integrated Trade Solution (WITS, 2016), in terms of US import share (%) of T&A products from the world, China is the major player. On the contrary Bangladesh competes in US as the second largest supplier of T&A after China and it shows a strong competition between the two countries to grab the US market. Export earnings from USA, the largest market for Bangladeshi T&A goods as a single country (WITS, 2016). From the same source of statistics also shows the strong competition of Bangladeshi T&A export to Canadian market with China. In Canada also Bangladesh is the second largest country after China for Canadian import of T&A goods (WITS-Canada).

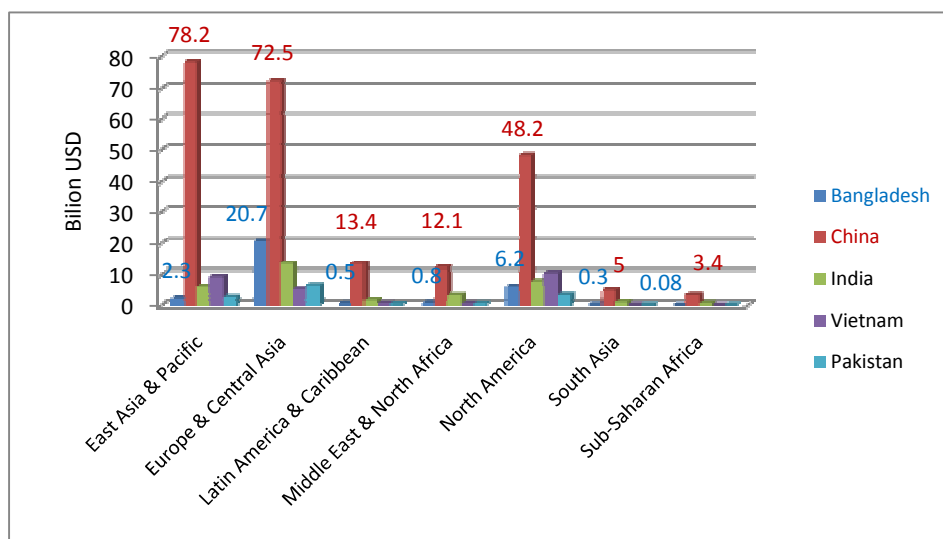


Figure 5: Export of T&A to global markets by the major exporters in 2015

Source: Database of World Integrated Trade Solution WITS and (Comtrade, 2016) (compiled by the authors in November 2016)

Besides North America, Europe and Central Asian market is a very crucial market for Bangladesh T&A industry as more than 60 % of total export of T&A is to the EU market

(figure 5) and Bangladesh enjoys some quota to export in EU market. According to the statistics provided by the US Department of Commerce (USDC, 2016), in EU Market China is also the major exporter, where Bangladesh is the second major exporter in EU Central Asian and it also shows a strong competition between the two countries to grab the EU and Central Asian market. In East Asia and pacific market, China is also the major player where Bangladesh positions 5th largest exporter (figure 5). In Latin American and Caribbean market also China is the largest exporter. For Bangladesh it's a potential non-traditional and emerging market for her export of T&A (figure 5). Middle East and North Africa is another potential emerging market for Bangladesh's T&A export. Here also China is the major player where Bangladesh is the 4th largest exporter (figure 5). In South Asian market and Sub Saharan Markets also China is the largest exporter and Bangladesh playing as the third and fourth consequently (figure 5). All these markets are non-traditional and emerging markets for the world textile and apparel export as well as for Bangladesh (Berg, 2011; BKMEA, 2016b; Malouche, 2015; Mirdha, 2013; Sattar, 2015).

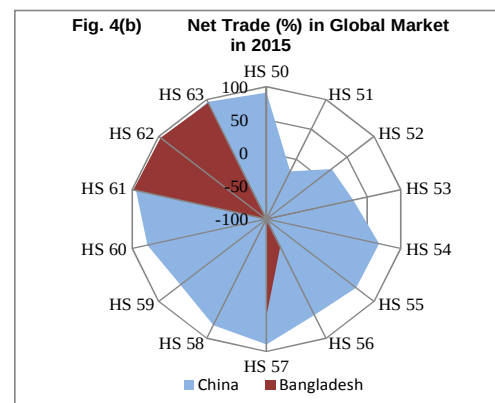
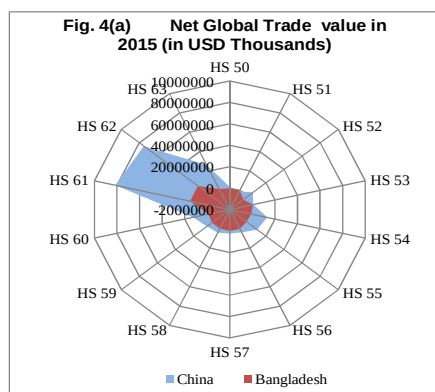


Figure 6(a) Net Global Trade Value and 6(b) Net Trade % for T&A Industry in 2015
Source: Database of International Trade Center (ITC) and (Comtrade, 2016), compiled by the authors in November 2016

In terms of global trade in the 14 products of Textile and apparel, China is the Major market player comparing to Bangladesh. The figure 6(a) shows the difference in net trade values between China and Bangladesh in 2015. Where the HS 61: Articles of apparel, accessories, knit or crochet, HS 62: Articles of apparel, accessories, not knit or crochet and HS 63: Other made textile articles, sets, worn clothing etc. are the most valued products in trade for both countries. In terms of net global trade (%) for Bangladesh shows figure 6(b) that HS 57: Carpets and other textile floor coverings, the HS 61: Articles of apparel, accessories, knit or crochet, HS 62: Articles of apparel, accessories, not knit or crochet and HS 63: Other made textile articles, sets, worn clothing etc. are the main products in this industry occupying the larger share. On the other hand for China, HS 54 to HS 63; all those 10 products occupied the larger net trade (%) in the global export.

The Textile and Apparel sector is characterized by geographically dispersed production and rapid market-driven changes, providing employment opportunities to millions of workers worldwide especially for young women (ILO, 2016a). About 75 million people are employed in the textile and apparel sector worldwide in 2014. The Employment in T&A accounted by top T&A exporters; China (6.7 million), India (16.8 million), Bangladesh (4.9 million), Indonesia (3.8 million) and Pakistan (3.6 million) (ILO, 2016b). Due to the scale and the profile of workers employed, the sector offers great potential to contribute significantly to economic and social development of the countries (Huynh, 2015). Regarding export values

143 and commodities, T&A industry accounts 75.14% for Bangladesh and 11.9% for China
144 compare to their total export in 2015 (figure 2). Considering the factors and importance, this
145 study on textile and apparel industry of Bangladesh and China has much significance for the
146 existing literature gap in this area. This research explores the valuable insights of
147 comparative advantage and competitiveness of 14 key products (according to HS 2digit
148 level) of textile and apparel industry of Bangladesh and China.

149 2. LITERATURE REVIEW

150 Bangladesh economy which is being integrating with the world economy has left largely
151 unhurt by the recent financial tsunami. Apart from GDP growth, other key economic
152 variables have shown minimum fluctuation in the recent years (Haque, 2011); (Ramesh
153 Kurpad, 2014). Being the pillar industry, Bangladesh's T&A is a very dynamic sector has
154 become the main source of direct and indirect employment, foreign exchange earnings,
155 which in turn helped finance a growing share of imports of vitally important capital goods and
156 essential inputs. The export-oriented T&A sector, with about 5600 firms and a workforce of
157 directly 4.0 million and more than one million indirectly is a critical and important segment of
158 the economy of Bangladesh (Z, Anne, & Audrey, 2014); (BGMEA, 2016); (BKMEA, 2016a).
159 At present, it contributes 40 per cent value addition to the manufacturing sector. T&A sector
160 which constitutes 79.63% in the total export basket (BIDA, 2016) is expected that within
161 2030 T&A sector would be able to earn more than US \$ 50 billion if the infrastructural facility
162 like electricity and gas as well port facility is provided. Bangladesh is now the 3rd largest
163 exporter of T&A products as a single country in the world market (TEXPROCIL, 2015).

164 Since the 1990s, Bangladesh and China have both made progresses in their international
165 trade. With the expansion of their trade volumes and global markets, the overlapping parts of
166 their exporting products and markets have been enlarging, which has been bringing
167 competition between the two countries (Hossain et al., 2013). China's movement towards
168 export oriented development strategy may have altered the picture of comparative
169 advantage for labor intensive manufacturing economies in the global market (Elout et al.,
170 2013); (Lau et al., 2009); (Tao & Fu, 2007); (Miao, Xin, & Chenayah, 2016). There is an
171 ongoing debate across developing countries and emerging concern about the threat and
172 opportunity in relation to the rise of Chinese economy and the consequent intensification of
173 competition in labor intensive manufacturing countries, especially in T&A industry (Fang,
174 2012); (Rasiah, Kong, & Vinanchiarachi, 2011); (Ruan & Zhang, 2014). It is important
175 therefore, to explore the structure of comparative advantage of T&A industry of Bangladesh
176 and China and the extent to which products the two economies compete with each other in
177 the global market of T&A. This paper makes an attempt to develop some insights on the
178 issues for textile and apparel industry.

179 Comparative advantage has been an important concept in modern economic theory which is
180 a concept of more than 200 years old that are immovable until today and is considered
181 determinant of specialization in the concept of international trade (Quy-Toan, DoLevchenko,
182 ARaddatz, & Claudio, 2016); (Macleans Mzumara, 2013). Liesner (Liesner, 1958) is the first
183 person who introduced the measurement of reveal comparative advantage (RCA) (YUE &
184 HUA, 2002) and later on developed by Blassa (Balassa, 1965), (Balassa, 1977), (Balassa,
185 1979) and Bela (B. Bela, 1986). The classical theory of comparative advantage predicted
186 that gains from exchange maximize welfare and free trade would lead to world economic
187 prosperity. According to a country's relative export performance in individual product
188 categories has been taken to reflect its 'revealed' comparative advantage. Technically, the
189 doctrine of RCA argues that if a country's share in world exports of a particular good is
190 greater than its overall share in total world exports, then the country has a revealed
191 comparative advantage in the export of that good. In other meaning, RCA explains if a

country can produce a good at a lower relative cost than other countries in international trade, the concern country should devote more of its scarce resources to the production of the goods (Batra & Khan, 2005b); (Quy-Toan et al., 2016); (Shafaei, 2009); (Ullah, Muhammad, & Kazuo, 2012); (Utkulu & Seymen, 2004). The concept of RCA is also widely used empirically to identify a country's weak and strong export sectors (Hinloopen & Marrewijk, 2004). For example, Hubbard (Fertő & Hubbard, 2002), who analyzed the revealed comparative advantage and competitiveness in Hungarian Agri-food sectors; (Batra & Khan, 2005a), who analyzed the revealed comparative advantage of India and China. YUE and HUA (YUE & HUA, 2002) analyzed the comparative advantage explains export patterns in China. Havrila (Havrila & Gunawardana, 2003) explored the comparative advantage and competitiveness for Australia's textile and clothing industries. Vixathap (Vixathap, 2013) analyzed Cambodia's comparative advantage patterns and trade structure. As following the above mentioned literatures reveal the existing studies on comparative advantage analysis by RCA in different geographical areas and industries.

The existing literature on the comparative advantage and competitiveness analysis of textile and apparel industry for Bangladesh and China are as following. Rahman and Anwar (Rahman & Anwar, 2006) analyzed Bangladesh's apparels export to the US market regarding the competition with China. The authors compared the export competitiveness and price competitiveness of 15 products of apparel industry between China and Bangladesh. The authors also made several recommendations related to policies of the industry i.e. productivity enhancement, reducing the lead time, compliance assurance and preferential market access. Mohammed Ziaul Haider (Haider, 2007) explored the Competitiveness of the Bangladesh ready-made garment industry in major international markets and the author emphasized in his research regarding the competition faced by Bangladesh after the MFA and also recommended to improve the factory compliances and market diversification. Joarder and et al. (Joarder, Hossain, & Hakim, 2010) analyzed the post-MFA export performance of major apparel exporting countries with special concentration on that of Bangladesh's readymade garments (RMG). Mottaleb and Sonobe (Mottaleb & Sonobe, 2011) analyzed the Rapid Growth of the Garment Industry in Bangladesh using primary data from the knitwear manufacturers and garment traders. Jahid Hasan (Hasan, 2013) analyzed the Competitiveness of Ready Made Garments Industry of Bangladesh in Post MFA Era, where the author explored the consequences of post MFA era of Bangladesh Apparel industry. Karaalp and Yilmaz (Karaalp & Yilmaz, 2013) explored the comparative advantage of four countries in the world: Bangladesh, China, Germany and Turkey was analyzed with respect to the US and the EU-15 textiles and clothing markets by employing Balassa's revealed comparative advantage (RCA) index for the period 2000-2010. Where the findings showed that the Bangladesh clothing industry had a substantially higher comparative advantage in all three markets compared to the other countries. Alam and Natsuda (Alam & Natsuda, 2013) explored the competitiveness of Bangladeshi garment industry by analyzing the macroeconomic and industrial-specific factors based on a survey of 70 firms in the country. Their study reveals that, the Bangladeshi garment industry has various impediments such as insufficient infrastructure; corruption and labor unrest etc. But factors such as labor cost, market access policy and technological development have been significantly contributing to the creation of the export competitiveness of the Bangladeshi garment firms. Lalit Mohan Kathuria (Mohan Kathuria, 2013) Analyzed the competitiveness of clothing export sector of India and Bangladesh using Revealed Comparative Advantage (RCA) and the findings revealed that the comparative advantage for Bangladesh increased from 21 products to 29 products between 1995 and 2003 at the at the HS 4-digit level.

The above mentioned literatures mostly explored the consequences of the readymade garments (Apparel) industry not about textile. Very few of the literatures exists that conducted research on both of textile and apparel collectively. Therefore, we didn't find any

literature that analyzed the 2 digit HS product level of textile and apparel industry of China and Bangladesh till now. Because of the existing research gap in the mentioned area, this research will have significant contribution to fill up the space. In this study, we analyzed RCA and Spearman Rank Correlation coefficient (r_s) of Textile and Apparel (T&A) industry of Bangladesh to explore following issues:

(1) For Bangladesh and China, which products in the T&A industry have higher revealed comparative advantage in global market?

(2) What kind of inter-temporal variation in RCA in the T&A industry took place from 2000 to 2015 for both Bangladesh and China in the global market?

(3) Regarding to the international trade relationship between this two countries in T&A, do they competitive or complementary in global market?

3. THE METHODOLOGY AND MODEL

3.1. Data

The analysis is based on the annual time series data of textile and apparel exports, obtained from several sources. For Analyzing the RCA, we mainly used the International Trade Centre (ITC, 2016), World Integrated Trade Solution (WITS, 2016) and UN Comtrade (Comtrade, 2016), database over the period of 2000 to 2015. We had to use multiple data sources because of data unavailability of some recent years especially for the case of Bangladesh. The authors compiled the data from those mentioned sources to analyze the RCA of Bangladesh's part. The data is used in the form of 2-digit HS (Harmonized System) Code listing of 14 products of textile and apparel industry of Bangladesh and China. MS Excel has been used to analyze the Revealed Comparative Advantage (RCA) data and SPSS statistical tool has been used to analyze the Spearman Rank Correlation Coefficient (r_s).

We also used the database of Bangladesh Garments Manufacturing and Exporters Association (BGMEA, 2016), Bangladesh Knitwear Manufacturing and Exporters Association (BKMEA, 2016a) China Textile Import and Export Chamber of Commerce (CCCT, 2016) to show some statistical trends of the T&A industry for the both nations.

3.2. Revealed Comparative Advantage

Revealed comparative advantage indices (RCA) use the trade pattern to identify the sectors in which an economy has a comparative advantage, by comparing the country of interests' trade profile with the world average. In other words, it is the ratio of the exports of the commodity from the source to total exports from the source, over the same ratio for the world (Fertő & Hubbard, 2002). In this paper we used Balassa's (Balassa, 1965) RCA model to measure the relative export performance by country and industry/commodity, defined as a country's share of world exports of a commodity divided by its share of total world exports (Balassa, 1977, 1979; B. a. Bela, 1986; Seyoum, 2007). The index for country i commodity j is calculated as follows:

$$RCA_{ij} = \frac{\frac{X_{ij}}{X_t}}{\frac{X_{wj}}{W_t}} \dots\dots\dots (1)$$

i=1, 2 ,....., n , j=1, 2,....., m

Where RCA_{ij} is revealed comparative advantage of country i for Product j,

X_{ij} denotes export by country i of Product j ,

X_{wj} denotes total amount of global exports of Product j

X_t denotes total global exports of country i

X_w denotes total amount of global exports.

Range of values:

The index of revealed comparative advantage RCA_{ij} has a relatively simple interpretation.

It Takes values between $-\infty$ and $+\infty$. The value may be equal, greater or less than 1.

If it is greater than one; $RCA_{ij} > 1$ it means the country i has a comparative advantage in exports of commodity j because its market share is larger in the commodity than its share in total exports and vice versa. If the value $RCA_{ij} < 1$ it interprets the vice versa.

The advantage of using the comparative advantage index is that it considers the intrinsic advantage of a particular export commodity and is consistent with changes in an economy's relative factor endowment and productivity. The disadvantage is that it cannot distinguish improvements in factor endowments and pursuit of appropriate trade policies by a country (De Benedictis & Tamberi, 2001) (Sanidas & Shin, 2010), (Hanson, Lind, & Muendler, 2015) (FAO, 2015).

3.3. Spearman Rank Correlation Coefficient (r_s)

With the RCA, the Spearman's Rank Correlation Coefficient (r_s) can be calculated to explain the thorough competitiveness or complementariness between the studied countries (Zar, 1972), (Ramsey, 1989), (Gauthier, 2001), (Hauke & Kossowski, 2011), (Statistics, 2012)

$$r_s = 1 - 6 \sum_{i=1}^n \frac{d_i^2}{n(n^2 - 1)} \dots\dots\dots (2)$$

Where $d_i^2 = [RCA (BD)_i - RCA (CN)_i]^2$

RCA (BD) and RCA (CN) are respectively Bangladesh's and China's RCA.

n=total selected years

Range of values: The value of r_s is ranged from -1 to +1.

A higher and positive value of the coefficient reflecting the fact that both the countries are contesting for a share in the world market is indicative of a competitive relationship between

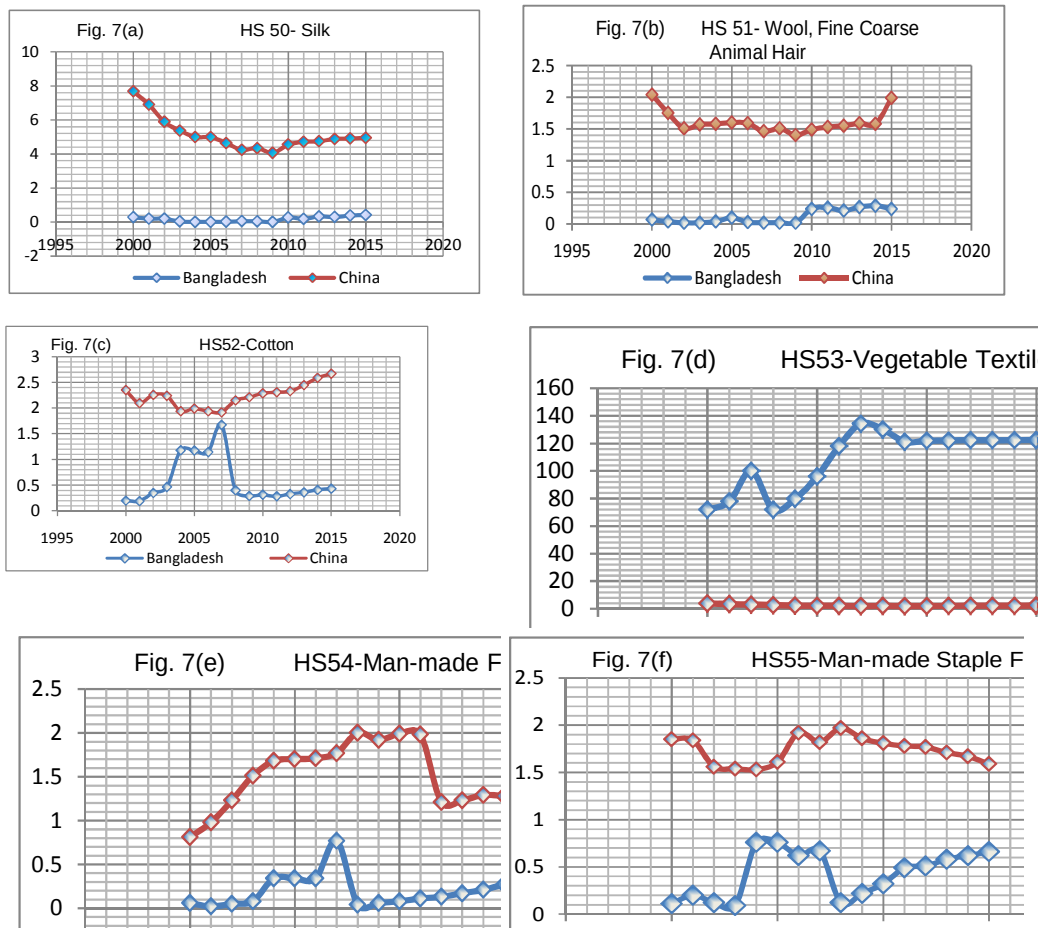
the two countries in the export market. A high negative coefficient in a similar fashion is indicative of complementarity in export specialization in the concern product between the two economies. A value of zero for the spearman correlation coefficient implies no relationship.

4. RESULT ANALYSIS AND DISCUSSIONS

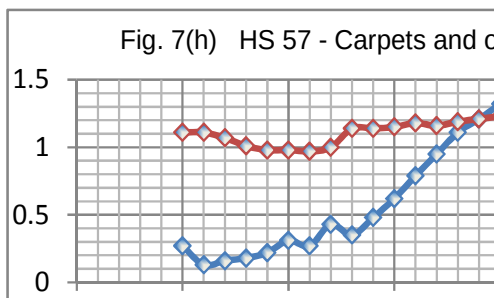
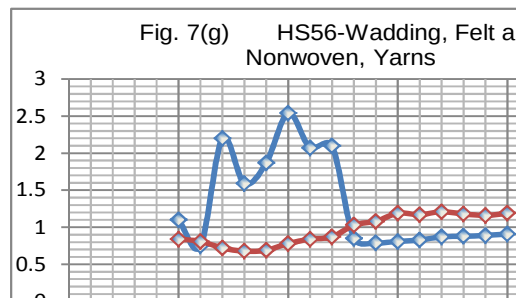
4.1. Comparative Analysis of RCA of 14 Products T&A for Bangladesh and China

The following figures from 7(a) to 7(n) explain the analyzed result of the revealed comparative advantage of 14 products between Chia and Bangladesh.

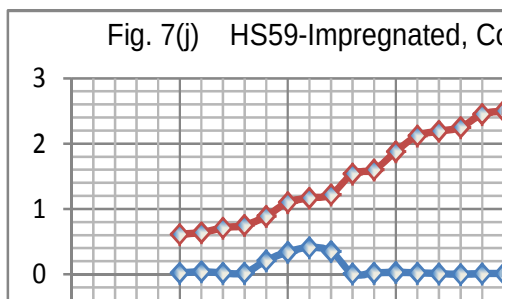
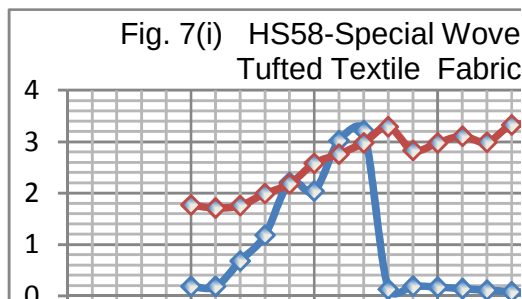
Figure 7(a)-7(n): The Analyzed Values of RCA



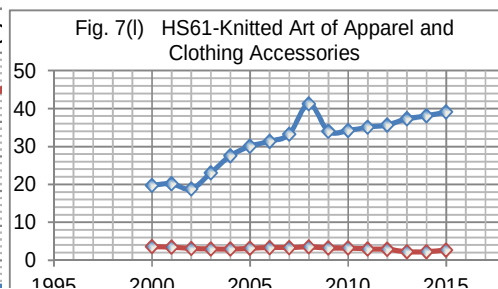
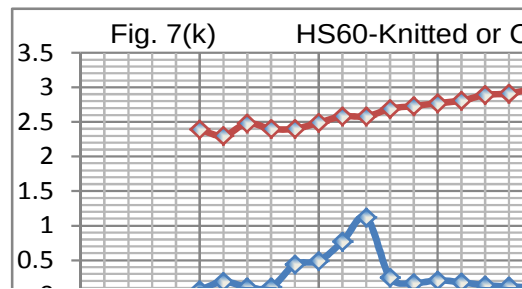
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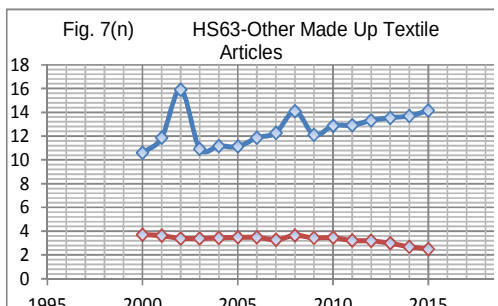
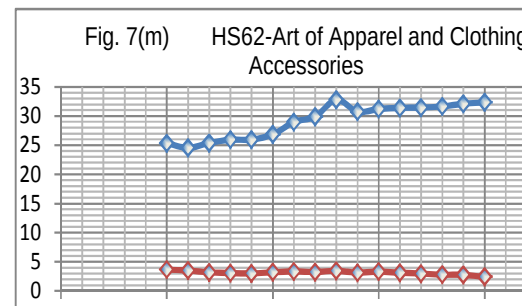
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331 ■ HS 50-Silk

332 The RCA value of HS 50-Silk for Bangladesh was 0.28 in the year of 2000 where its value
 333 decreased to 0.41 in 2015 fig. 7(a) and the value interprets that Bangladesh has no
 334 significant comparative advantage in her export of HS 50-Silk in global market. In terms of
 335 inter-temporal movements of RCA of HS 50 during 2000-2015 it shows Bangladesh's
 336 comparative advantage over HS 50-Silk is very insignificant, rather Bangladesh imports HS
 337 50-Silk from other countries e.g. China and India (ITC). On the contrary, the RCA value of
 338 HS 50 for China was 7.68 in 2000 fig. 7(a) which indicates China's strong comparative
 339 advantage over HS 50 in global market. But according to the inter-temporal movements of
 340 RCA over the period of 16 years during 2000-2015 China has been losing gradually her
 341 comparative advantage which decreased to 4.95 in 2009 fig. 7(a). In overall comparative

analysis of RCA it shows that for the product HS 50, China placed more advantageously than Bangladesh in global market.

▪ **HS 51-Wool, Fine Coarse Animal Hair and Horsehair**

The RCA value of HS 51-Wool, Fine Coarse Animal Hair and Horsehair for Bangladesh was 0.07 in the year of 2000 where its value remained insignificant to 0.24 in 2015 fig. 7(b) and it also interprets that Bangladesh has no comparative advantage in her export of HS 51 in global market. In terms of inter-temporal movement of RCA of HS 51 during 2000-2015 it shows Bangladesh has insignificant comparative advantage on HS 51- Wool, Fine Coarse Animal Hair and Horsehair, rather Bangladesh depends importing HS 51 from other countries e.g. China, India and central Asian countries. On the contrary, the RCA value of HS 51 for China was 2.04 in 2000 fig. 7(b) which indicates China's strong comparative advantage over HS 51 in global trade. But according to the inter-temporal movements of RCA over the period of 16 years during 2000-2015 China has been losing her comparative advantage which decreased to 1.99 in 2015 fig. 7(b). In overall comparative analysis of RCA it shows that for the product HS 51, China placed more advantageously than Bangladesh in global market and China still the top exporter of HS 51-Wool, Fine Coarse Animal Hair and Horsehair in 2015 (ITC).

▪ **HS 52-Cotton**

The RCA value of HS 52-Cotton for Bangladesh was 0.20 in the year of 2000 where its value increased to 1.21 in 2015 fig. 7(c). But from 2004 to 2007 the RCA value was greater than 1 which means Bangladesh gained her comparative advantage on HS52 over the period but Bangladesh again lost her comparative advantage after 2007. Being high demand of HS52 and decreasing local production of cotton Bangladesh lost her comparative advantage in exporting of HS52 in global market. In order to keep the comparative advantage on HS 52, Bangladesh government should put more initiative in growing more cotton to meet up the increasing demand in her local market as well as to export. In terms of inter-temporal movements of RCA of HS52 during 2000-2015 it shows Bangladesh yet has no comparative advantage on HS 52, rather Bangladesh depends on importing HS52 from other countries e.g. China, Pakistan, India and central Asian countries. On the contrary, the RCA value of HS 52 for China was 2.35 in 2000 fig. 7(c) which indicates China's quite strong comparative advantage over HS52 in global market. But according to the inter-temporal movements of RCA over the period of 16 years, China gained a little comparative advantage which decreased to 2.57 in 2009 fig. 7(c). In overall comparative analysis of RCA it shows that for the product HS 52, China placed more advantageously than Bangladesh in global market.

▪ **HS 53-Textile Fibers**

The RCA value of HS 53-Vegetable Textile Fibers for Bangladesh was 71.90 in the year of 2000 where its value increased to 122.49 in 2015 fig. 7(d). That interprets the very high comparative advantage for Bangladesh in global market. In terms of inter-temporal movements of RCA of HS 53 during 2000-2015 it shows that the comparative advantage decreased during 2003 to 2005 but it again increased from 2006 and it has been increasing sharply after 2007. On the contrary, the RCA value of HS 53 for China was 3.84 in 2000 fig. 7(d) which indicates China's quite strong comparative advantage over HS 53- Vegetable Textile Fibers in global market. But according to the inter-temporal movements of RCA over the period of 16 years, China has been losing her comparative advantage which decreased to 2.39 in 2015 fig. 7(d). In overall comparative analysis of RCA it shows that for the product HS 53, Bangladesh placed more advantageously than China in global market. Bangladesh also the second largest exporter of HS 53 after China in 2015 (ITC)

389 ▪ **HS 54-Man-made Filaments**

390 The RCA value of HS 54-Man-made Filaments for Bangladesh was 0.06 in the year of 2000
391 where its value remained same to 0.27 in 2015 fig. 7(e) and it also interprets no comparative
392 advantage for Bangladesh in global market. In terms of inter-temporal movements of RCA of
393 HS54 during 2000-2015 it shows that the comparative advantage increased during 2004 to
394 2007 but it again decreased from 2008 and remained insignificant. On the contrary, the RCA
395 value of HS54 for China was 0.81 in 2000 fig. 7(e) which indicates China had no
396 comparative advantage over HS 53 in global market but gradually the RCA of China
397 increased sharply from 2002 and it reached 1.28 in 2015 that interprets China gained her
398 comparative advantage over HS 54-Man-made Filaments. In terms of inter-temporal
399 movements of RCA of HS54 for China during 2000-2015 it shows that the comparative
400 advantage increased during 2002 to 2011 and again decreasing from 2012 to 2015. In
401 overall comparative analysis of RCA it shows that for the product HS 54, China placed more
402 advantageously than Bangladesh in global market.

403 ▪ **HS 55-Man-made Staple Fibers**

404 The RCA value of HS 55-Man-made Staple Fibers for Bangladesh was 0.11 in the year of
405 2000 where its value increased a little to 0.66 in 2015f. 7(f) and it also interprets no
406 comparative advantage for Bangladesh in global market. In terms of inter-temporal
407 movements of RCA of HS 55 during 2000-2015 it shows that the comparative advantage
408 increased during 2004 to 2007 but it again decreased from 2008 and remained 0.66 in 2015.
409 On the contrary, the RCA value of HS 55 for China was 1.85 in 2000 fig. 7(f) which indicates
410 China had quite high comparative advantage over HS 53- Vegetable Textile Fibers in global
411 market. In term of inter-temporal movements of RCA of China, the analysis shows that the
412 RCA decreased a little from 2002 to 2005 and it again increased from 2006 reached 1.59 in
413 2015 fig 7(f). In overall comparative analysis of RCA it shows that for the product HS 55,
414 China placed more advantageously than Bangladesh in global market.

415 ▪ **HS 56-Wadding Felt and Non-woven Yearns**

416 The RCA value of HS 56-Wadding Felt and Non-woven Yearns for Bangladesh was 1.10 in
417 the year of 2000 where its value decreased to 0.89 in 2015 fig. 7(g)) and it also interprets for
418 Bangladesh lost her comparative advantage in global market. In terms of inter-temporal
419 movements of RCA of HS 56 during 2000-2015 it shows that the comparative advantage
420 increased during 2002 to 2007 but it again decreased from 2008. On the contrary, the RCA
421 value of HS 56 for China was 0.84 in 2000 Fig. 7(g) which indicates China had no
422 comparative advantage over HS56 in global market up to 2007. In terms of inter-temporal
423 movements of RCA of China, the analysis shows that China gained her comparative
424 advantage from 2008 and its value reached 1.16 in 2015 fig. 7(g). In overall comparative
425 analysis of RCA, it shows that for the product HS 56, China placed more advantageously
426 than Bangladesh in global market.

427 ▪ **HS 57-Carpets and other Textile Floor Covering**

428 The RCA value of HS 57-Carpets and other Textile Floor Covering for Bangladesh was 0.27
429 in the year of 2000 where its value increased to 1.32 in 2015 fig. 7(h) and it also interprets
430 for Bangladesh's gaining comparative advantage in global market. In term of inter-temporal
431 movements of RCA of HS 57 during 2000-2015 it shows that the comparative advantage has
432 been increasing from 2007 to 1.32 in 2015. On the contrary, the RCA value of HS 57 for
433 China was 1.11 in 2000 and increased to 1.23 in 2015 fig. 7(h) which indicates China has
434 been maintaining her comparative advantage over HS 57 in global market. In term of inter-

temporal movements of RCA between China and Bangladesh in the mentioned 16 years period; Bangladesh dramatically gained her comparative advantage over HS 57 from 2013. In overall comparative analysis of RCA it shows that for the product HS 57, Bangladesh placed more advantageously than China in the global market.

▪ **HS 58-Special Woven Fabrics, Tufted Textile Fibers**

The RCA value of HS 58-Special Woven Fabrics, Tufted Textile Fibers for Bangladesh was 0.18 in the year of 2000 where its value decreased to 0.02 in 2015 fig. 7(i) and it also interprets for Bangladesh having no comparative advantage in global market. In term of inter-temporal movements of RCA of HS 58 during 2000-2015 it shows that the comparative advantage increased dramatically from 2003 to 2007 but its value again decreased from 2008 and it continued. On the contrary, the RCA value of HS 58 for China was 1.77 in 2000 fig. 7(i) which indicates China had quite good comparative advantage over HS 58 in global market and it had been increasing sharply reached 3.39 in 2009 fig. 7(i). In overall comparative analysis of RCA it shows that for the product HS 58, China placed more advantageously than Bangladesh in global export.

▪ **HS 59-Impregnated Coated, Covered Laminated Textile**

The RCA value of HS 59-Impregnated Coated, Covered Laminated Textile for Bangladesh was 0.02 in the year of 2000 where its value didn't change significantly fig. 7(j) and it also interprets for Bangladesh having no comparative advantage in global market. In terms of inter-temporal movements of RCA of HS 59 during 2000-2015 it shows that Bangladesh didn't get comparative advantage over HS 59 over the mentioned 16 years period.. On the contrary, the RCA value of HS 59 for China was 0.61 in 2000 fig. 7(j) which indicates China had no comparative advantage over HS59 in global market in 2002 but gradually the RCA value increased sharply and reached 2.50 in 2015 fig. 7(j) that means China gained her comparative advantage over HS 59 from 2005. In overall comparative analysis of RCA it shows that for the product HS 59, China placed more advantageously than Bangladesh in global market.

▪ **HS 60-Knitted or Crocheted fabrics**

The RCA value of HS 60-Knitted or Crocheted fabrics for Bangladesh was 0.07 in the year of 2000 where its value remained very similar to 0.09 in 2009 fig. 7(k) and it also interprets for Bangladesh having no comparative advantage in global market. In terms of inter-temporal movements of RCA of HS 60 during 2000-2015 it shows that the RCA value advantage increased a little from 2004 and Bangladesh gained comparative in 2007 but its value again decreasing from 2008. On the contrary, the RCA value of HS 60 for China was 2.39 in 2000 fig. 7(k) which indicates China had good comparative advantage over HS 60 in global market in 2002 and its value smoothly increased a little to 3.13 in 2015 fig. 7(k). In overall comparative analysis of RCA, it shows that for the product HS 60, China placed more advantageously than Bangladesh in global market.

▪ **HS 61-Knitted art of Apparel and Clothing Accessories**

The RCA value of HS61-Knitted or Crocheted fabrics for Bangladesh was 19.75 in the year of 2000 where its value increased sharply to 39.1 in 2015 fig 7(l) and it also interprets for Bangladesh having quite high comparative advantage in global market. In terms of inter-temporal movements of RCA of HS 61 during 2000-2015, it shows that the comparative advantage increased sharply from 2002 up to 2015 and its value decreased a little in 2009 fig. 5(l). On the contrary, the RCA value of HS 61 for China was 3.57 in 2000 Fig. 5(l) which

indicates China also had good comparative advantage over HS 61 in global market in 2002 and its value decreased significantly to 2.68 in 2015 fig. 7(l). It's because of the relocation of Chinese clothing firms to abroad due to her economic shifting and labor cost (Miao et al., 2016). In overall comparative analysis of RCA it shows that for the product HS 61, Bangladesh and China both placed equally advantageous in global market. But Bangladesh's performance of export is comparatively favorable position than China. In the terms export value in global market Bangladesh placed in the second position after China in 2015 (ITC, 2016).

▪ HS 62-Art of Apparel Clothing Accessories

The RCA value of HS 62-Art of Apparel Clothing Accessories for Bangladesh was 25.33 in the year of 2000 where its value increased sharply to 32.35 in 2015 fig. 7(m) and it also interprets for Bangladesh having quite high comparative advantage in global market. In terms of inter-temporal movements of RCA of HS 62 during 2000-2015 it shows that the comparative advantage increased sharply from 2005 up to 2008 and its value decreased a little in 2009 fig. 7(m). On the contrary, the RCA value of HS 62 for China was 3.66 in 2000 fig. 7(m) which indicates China also had good comparative advantage over HS 62 in global market in 2002 and its value decreased significantly to 2.41 in 2015 fig. 5(m). In overall comparative analysis of RCA it shows that for the product HS 62, Bangladesh and China both placed equally advantageous in global market. For HS 62 also Bangladesh's performance of export is comparatively favorable position than China and in the terms export value in global market Bangladesh placed in the second position after China in 2015 (ITC, 2016).

▪ HS 63-Made up Textile articles

The RCA value of HS 63-Made up Textile articles for Bangladesh was 10.59 in the year of 2000 where its value increased to 12.11 in 2009 fig. 7(n) and it also interprets for Bangladesh having quite high comparative advantage in global market. In terms of inter-temporal movements of RCA of HS 63 during 2000-2015 it shows that the comparative advantage increased smoothly to 14.15 in 2015 fig. 7(n). On the contrary, the RCA value of HS 63 for China was 3.72 in 2000 fig. 7(n) which indicates China also had good comparative advantage over HS63 in global market in 2002 and its value decreased significantly to 2.51 in 2015 fig. 7(n). In overall comparative analysis of RCA it shows that for the product HS 63 that Bangladesh and China both placed equally advantageous in the global market. But Bangladesh's position is more competitive than China according to the RCA value.

4.2. Analysis of Competitiveness of 14 Products of T&A for Bangladesh and China

Table 1 The Analysed Result of Spearman's Rank Correlation Coefficient (r_s) of 14 products of T&A industry between Bangladesh and China according to their values

HS	Name of Product	Value of r_s
<i>Higher value of $r_s=(0.50-1)$; Exist Higher Competition between Bangladesh and China</i>		
57	Carpets and other textile floor covering	0.879
62	Art of Apparel Clothing Accessories	0.655
61	Knitted art of Apparel and Clothing Accessories	0.530
<i>Modest value of $r_s=(0.01-0.49)$;Exist Modest Competition between Bangladesh and China</i>		
63	Made up Textile articles	0.315
53	Vegetable Textile Fibers	0.297
56	Wadding Felt and Non-woven Yarns	0.157

60	Knitted or Crocheted Fabrics	0.139
58	Special Woven Fabrics, Tufted Textile Fibers	0.127
59	Impregnated Coated, Covered Laminated Textile	0.109
Lower value of $r_s < -1$, Exist complementary between Bangladesh and China		
51	Wool, fine coarse animal hair, horsehair	-0.145
54	Man-made Filaments	-0.176
50	Silk	-0.239
55	Man-made Staple Fibers	-0.373
52	Cotton	-0.730

517

518 In table 1, the degree and nature of competition between Bangladesh and China in the world
519 market over 2000-2015 have been evaluated by calculating the (SRC) Spearman's Rank
520 Correlation coefficients for RCA indices for Bangladesh and China in the world market for
521 the products of Textile and Apparel. The aim is to identify, the products where Bangladesh
522 and China compete/complement in the global market.

523 Before analyzing the SRC, we conducted test to find out the out the monotonic relationship
524 between the two variable and both of them passed the test having significant monotonic
525 relationship. We measured the two variables in interval scale having 3 point scale; higher
526 competition, modest competition and complementary. As following, the SRC value ranged
527 from 0.50-1 reveals the higher competition between two nations for the specific product,
528 SRC value ranged from 0.01-0.49 reveals modest competition between two nations for the
529 specific product and SRC value < -1 reveals complementary between two nations for the
530 specific product.

531 The analyzed result of SRC of 14 products (table 1) shows that; higher competition exist in 3
532 products out of the 14 products including HS 57, HS 62, and HS 61 that also interprets
533 highest competitiveness between two countries among those goods in the global market.

534 On the other hand, modest competition exist in 6 products respectively; HS 63, HS 53, HS
535 56, HS 60, HS 58 and HS 59 out of the 14 products between China and Bangladesh which
536 also means medium level of competitiveness between the two economies. The products are
537 categorized according to their value of SRC showed in the (table 1).

538 On the contrary, there exists complementariness in five remaining products; respectively HS
539 51, HS 54, HS 50, HS 5, and HS 52 between Bangladesh and China in global market.
540 Among them, HS52, HS56, and HS63 were the three top ones with the highest level of
541 complementariness, especially the product of HS 52.

542 5. CONCLUSIONS AND RECOMMENDATIONS

543 In this paper revealed comparative advantage has been analyzed at the two digit level of HS
544 classification for both Bangladesh and China. Our analysis reveals that among the selected
545 14 products; Bangladesh placed more advantageously than China over 5 products
546 respectively; HS 57, HS 62, HS 61 HS 63 and HS 53. On the other hand China placed more
547 advantageously than Bangladesh over 9 products respectively; HS 50, HS 51, HS 52, HS
548 54, HS 55, HS 56, HS 58, HS 59 and HS 60 in global market; Bangladesh and China both
549 countries equally placed advantageous over 3 products respectively; HS61, HS62 and HS63
550 in global market.

551 According to the inter-temporal variation of RCA in the mentioned period; Bangladesh
552 improved her comparative advantage over 5 products respectively; HS 53, HS 57, HS 61,
553 HS 62 and HS 63, lowered over 7 products respectively; HS 52, HS 54, HS 55, HS 56 HS,
554 HS 58, 59 and HS 60; remained quite unchanged over 2 products respectively; HS 50 and
555 HS 51 whereas China improved her comparative advantage over 10 products respectively

556 HS 50, HS 51, HS 52, HS 53, HS 54, HS 55, HS 56, HS 58, HS 59 and HS 60; lowered over
557 4 products respectively HS 57, and HS 60, HS 61, HS 62 and HS 63. From the results it
558 reveals that the T&A Sector in Bangladesh is mostly dominated by the Ready Made
559 Garments industries which are mainly the final products of this industry. On the other hand
560 the T&A industry of China revealed strong positions both in textile and apparel products.

561 Furthermore; based on the analyzed result of (SRC) Spearman's Rank Correlation
562 coefficients, the policy related recommendations are as following;

563 ■ According to the competitiveness analysis of the 14 products; 3 products (table 1) exist
564 higher competition. As Bangladesh has some advantages regarding low labor cost and
565 labor availability, the competitiveness of these products could be kept for the time being.
566 But for the long term competitiveness, the industry should accumulate with advance
567 technology, backward linkage industries and labor compliances. Especially increasing
568 efficiency along with the value chain such as integration between textile and apparel;
569 and improving social and environmental compliance by introducing better human
570 resource practices could provide sustainable development for Bangladesh's T&A
571 industry. By promoting FDI for textile and apparel and adopting clear and transparent
572 policies on foreign ownership within export processing zones and special economic
573 zones and investment in infrastructure, education, and trade support, Bangladesh could
574 sustain her comparative advantage on these products. In the case of China, the
575 shrinking of labor and increasing labor cost forcing China to mover her labor intensive
576 T&A factories to other developing countries and this trend will continue.

577 ■ 6 products (table 1) exist modest competition. To improve the competitiveness, more
578 focus should be given on backward linkage industry of T&A for Bangladesh. Because of
579 having strong raw resources and technological advancement, China revealed a strong
580 competitor in the most products of this group in the global market. Though Bangladesh
581 has absolute advantage in producing vegetable textile fiber, the advantage can be
582 sustained supporting the farmers to cultivate the vegetable fiber (jute) with all subsidies.
583 It is crucial also for Bangladesh's T&A sector's competitiveness to continue investment
584 in transportation infrastructure and relocation of factories to improve lead times and
585 facilitate trade. Besides, developing and implementing supportive policies, and
586 improving governance at the national and factory levels are crucial measures to be
587 implemented to keep the competitiveness of the industry.

588 ■ The rest of the 5 products (table 1) exist complementary between two nations and they
589 are mutually benefited by exporting and importing these products among the industry.
590 Being abundant in producing cotton and other raw materials and technological
591 advancement, China revealed herself a very strong competitor in world market
592 producing and exporting the mentioned products. These products group are mainly
593 produced in China and Bangladesh imports the products from China for her readymade
594 garments to produce the final products of the apparel. The recent statistics of WITS
595 shows the significant increasing (2.96 Million USD in 2005 to 58.21 Million USD in 2015)
596 trends of Bangladesh's export of T&A products to China. The T&A export products share
597 of Bangladesh to China also very significant (45.46% in 2005 to 72.42% in 2015). The
598 causes behind the rapid export growth of T&A of Bangladesh to China are; firstly, after
599 China providing zero tariff treatment to 4762 products originated from Bangladesh and
600 other 32 Least Developed Countries in 2010 which includes the most of the products
601 T&A and secondly, the economic shifting of China from labor intensive industry to
602 technology based industry in T&A. ■ Beside the existing facilities, Bangladesh should
603 establish a healthier labor market adjusting with higher wages labor rights and better
604 training which will provide the sustainable growth of Bangladesh's T&A sector. Further

605 initiatives would help the T&A sector become more productive over the longer term to be
606 compete in the global markets and competitors. Therefore, increasing the number of
607 skilled workers, capacity building and making sophisticated items could move
608 Bangladesh's T&A sector toward higher-valued manufacturing to continue her export
609 growth and sustainability.

610 **LIMITATIONS**

611 The limitation of the current study is availability of export data for Bangladesh side in latest
612 couple of years. At last it could be managed by compiling data from ITC, UN Comtrade,
613 Bangladesh Garments Manufacturing and Exporters Association (BGMEA) and Bangladesh
614 Knitwear Manufacturing and Exporters Association (BKMEA) databases.

615

616

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622

623 **AUTHORS' CONTRIBUTIONS**

624

625 This work was carried out in collaboration among the authors. The research work is a part of
626 the Ph.D. research work of MEH. The Second Author HD is the Ph.D. supervisor of Author
627 MEH and has been guiding the first author regarding the Ph.D. research project. The
628 Authors HD, CZ and VTV are working in the same research group. Author CZ has also been
629 guiding MEH in his Ph.D. project. Author MEH designed the study, wrote the literature, set
630 up objectives and wrote the first draft of the manuscript. Author HD, CZ and VTV carried out
631 the analysis and reviewed the first draft manuscript. All authors read and approved the final
632 manuscript.

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