The Demand-Supply Structure of the Textile-Clothing Industry of Bangladesh & its Competitors

Kazuo Inaba and Md. Masum

Graduate School of Economics, Ritsumeikan University

Abstract

The objective of this paper is to know the demand-supply structure of the textile-clothing industry (TCI) of Bangladesh, China, India, Viet Nam and Indonesia which are the top five clothing exporting nations in the world and control 91% clothing exports of the region. We applied structural decomposition analysis for the demand-side analysis, whereas, vertical specialisation and linkage analysis for the supply-side analysis using national input-output tables for 2000 and 2011. The results show that among the economies, the domestic multiplier effect of the TCI in China is the highest. The domestic backward linkage coefficients are 3.09, 2.35, 2.17, 2.14 and 1.60 times for China, Viet Nam, India, Bangladesh and Indonesia respectively in 2011. In the growth path, the contribution of final demand effect outplayed technical change effect, whereas, export contribution is much higher than domestic demand expansion and import substitution for Bangladesh. Technical effect from 2000 to 2011 period in the TCI is the highest in Viet Nam (18%) followed by China, India, Bangladesh, and Indonesia. Vertical specialization in Viet Nam (35.4%) is the highest and the lowest is in China (3.8%). Considering the competitiveness, the paper concluded that the supply-side of the TCI in China is very good in the region, whereas, the demand-side of Viet Nam is stronger than China, India, Bangladesh and Indonesia.

Keywords: Demand-supply structure, Asian textile-clothing industry, Structural decomposition analysis, Input-output framework.

JEL classifications: C43, D57, F19, O11, O18, R15.

1. Introduction

The TCI is the gate of choice for most developing countries in their quest to step into industrialization (Kim, Traore, & Warfield, 2006). The TCI is the primary grounds of development in most Asian countries (Chen, Lau, Boansi, & Bilgin, 2016). As manufacturer-exporters, the Asian TCI is very important in the global apparel market. In recent decades, much of apparel manufacturing has shifted to Asia, particularly China, which has become the leading exporter of clothing followed, more recently, by Bangladesh (Taplin, 2014). The ending of the multi-fibre agreement (MFA) has become a development boon for the Asia (Heron, 2006). In future, even firms in the small countries of Asia can upgrade and be fashion retailers without having fiber and textile production bases if they can develop their own designs and brands, develop merchandizing, marketing and coordinating capabilities (Esho, 2015). Asian manufacturers experienced trade diversion, especially in textiles and apparel through new regionalism beyond prediction (Frankel & Wei, 1995).

China, Bangladesh, Hong Kong, Viet Nam, India, and Indonesia are the top six clothing exporters and competitors to each-other in the Asian region (World Trade Organization, 2017). International clothing market shares of China, Bangladesh, Viet Nam, India, and Indonesia are 43%, 6%, 4%, 4% and 2% respectively in 2013[1]. The WTO database also shows that Asia captures 60% of the global clothing exports and the selected five Asian countries capture 91% of the Asian clothing exports.

Clothing industry of Bangladesh is the second largest exporter in the world behind China with continued prospects for growth (Asian Development Bank, 2015). The TCI of Bangladesh is very significant in the country's economic structure. Its competitive position among the Asian competitors seems lucrative when we look at the export figures as it soars from nearly nil in 1980 to $26 billion in the 2015. There are many research studies on the TCI of Bangladesh. The previous studies focused on many different issues, some of them are as follows. Clothing export, employment and number of factories have

---

[1]As around 95% export from Hong Kong is re-exporting, we did the structural analysis of the top five export competitors excluding Hong Kong. As per WTO database, the export ranking of the clothing exporter are China ($175 billion) European Union ($112 billion), Bangladesh ($26 billion), Viet Nam ($22 billion), India ($18 billion) and Indonesia ($7 billion) in 2015 with annual growth of -6%, -11%,6%,10%, 2% and -10% respectively.

increased after phase out of MFA era (Ahmed, 2013); Bangladesh has a unique opportunity to restructure its domestic apparel sector, introducing new technologies and fostering domestic production linkages (Bhattacharya & Rahman, 1999); Huq, Stevenson, & Zorzini (2014) studied the social sustainability of clothing industry of Bangladesh as suppliers; a work on knowledge-based productivity in low-tech industries finds that in the clothing sector, higher education of the managers, licensing, and R&D raise productivity (Goedhuys, Janz, & Mohnen, 2013); a study on factory disaster in Bangladesh suggests that insatiable appetite for fashionable goods merely feeds a retail system that was set up to resolve earlier supply chain problems and ended up taking advantage of changing international trade regimes (Taplin, 2014) and many more studies. But, no study is available on the demand-supply structure of the industry.

TCI of India is playing a very crucial role in the post-liberalization evolution of the Indian economy (Kar, 2012). Previous studies on TCI of India covered many different issue like sub-sectoral restructuring by Anubhai & Mote (1994); international competitiveness by Bhattacharya & Raychaudhuri (1994), Kathuria & Bharadwaj (1998); market and product structure by Chatterjee & Mohan (1993); impact of WTO and domestic reform by Elbehri, Hertel & Martin (2003); policy issues by Ganesh (2002); production cost structure with some competitors by Gherzi (2003); structure of the industry by Roy (1999); among others.

The textile and apparel sector is of critical importance for the Indonesian economy (James, Ray, & Minor, 2002). The TCI as labor-intensive industry helps the government in reducing unemployment and poverty (Nauly, 2013). There are many studies on the TCI of Indonesia including James, Ray & Minor (2003) on the challenges of Indonesia's textile and apparel industry; import competition by Shippen (1999); Kuncoro (2013) examined the nature, role, clusters, and challenges of the TCI of Indonesia; Miranti (2007) investigated the performance of the TCI; etc.

The TCI is performing a very good role in the economy of Viet Nam because net-export[2] has increased from -391.8 million US dollars in 2000 to +1631 million US dollars in 2009 (Tran, 2012). The Asian Foundation (2012), Nguyen (2012), and Vu and Pham

---

[2] The difference between exported textile-clothing products and imported cotton, fiber, fabric and accessories.

(2016) analyzed the export competitiveness of garment and textile products; Nadvi, et.al (2004) and Dang & Dinh (2011) studied the value chain of TCI of Viet Nam; Knutsen (2004) studied buyer-driven networks of the garment industry in Vietnam; Goto, Natsuda, & Thoburn (2011) focused on price competitiveness of TCI with China; Goto (2013) look into the informal garment business scenario; etc.

China is the super power for the TCI. There are many myths about Chinese TCI. The shifting of US textile-clothing firms to China in the 1980s and 1990s was a conventional wisdom of the time which was never to return (Cooper, 2013). The China's TCI has transitioned from a planned economic system to a market economic system (Shen, 2008). There are many more studies like Antoshak (2006) studied on U.S.-China textile agreement; Cao (2012) analyzed competitiveness of Chinese TCI; ElSayed, Kulich, Lake & Megahed (2006) studied the TCI of Guangdong province; Lin, Li, & Yang (2011) studied firm level productivity of Chinese TCI; Ruan & Zhang (2014) studied migration pattern of TCI of China; Sonobe, Hu & Otsuka (2002) and Zhang, Ling, Zhang & Wang (2014) studied cluster formation of the TCI; Chi & Kilduff (2006) studied comparative advantage of the TCI; etc.

According to structural decomposition analysis in the input-output framework, the key determinants of demand-side in any industry are technical coefficient, final demand coefficient, export expansion coefficient, import substitution coefficient and domestic demand coefficient. Whereas, the key supply-side determinants are vertical specialization rate, linkages coefficients, primary factors contributions, etc. A very few studies are available on the demand-supply structure of the TCI. Some studies on specific issues like vertical specialization rate are available for some economies separately, but research on the major exporters in the region together is not available.

Demand-side and supply-side analysis on the Asian TCI in the input-output framework have not been discovered in the previous studies. As a result, the demand-supply structure of the Asian competitors is not yet clear to us. Through this study, we try to discover the demand-supply structure of the TCI and competitiveness among the countries. So, the research questions to be answered in this work are:

1. What is the demand-supply structure of the TCI of Bangladesh, China, Viet Nam, India and Indonesia?

2. What is the competitive position among these countries based on demand-supply indicators?

The rest part of the paper is structured as follows. Section 2 describes the methodology, Section 3 explains the international trade structure of the Asian TCI with import-export matrix, Section 4 explains the output structure of the economies, Section 5 evaluates the overall industrial structure of the economies based on normalized measures of backward and forward linkages, Section 6 analyses the demand-side of the TCI based on decomposition techniques, Section 7 discusses the supply-side of the TCI, Section 8 assesses the competitiveness among the TCI exporters, and finally Section 9 concludes the paper.

2. Data and Methodology

In this paper, we apply the input-output techniques. We develop the national input-output tables (NIOT) for Bangladesh and Viet Nam from the multi-regional input-output table (MRIO) of Asian Development Bank (ADB). NIOTs of China, India and Indonesia are sourced from world input-output database (WIOD). IOT of ADB and WIOD have used the same 35-sector classification.

For overall economic analysis, we use index of the power of dispersion (IPD) and index of the sensitivity of dispersion (ISD). The model for ISD and IPD, primarily, introduced by Rasmussen (1957) in the input-output environment. The model specifications for this analysis are given below:

$$\text{IPD} = \frac{\sum_{i=1}^{n} Rij}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} Rij}$$

$$\text{ISD} = \frac{\sum_{j=1}^{n} Rij}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} Rij}$$

Here, i indicates demanding sector, j indicates supplying sector, n indicates number of sectors, Rij is the element of the Leontief inverse. The coefficients are explained as the higher the value, the stronger the influence of the TCI on the other industries.

For demand-side analysis, we apply structural decomposition analysis (SDA) model in the input-output framework. We analyse the effect of technical change (TC), final demand change (FDC), domestic demand expansion (DE), export expansion (EE) and import substitution (IS) on the output change. For calculating TC and FDC, we used Dietzenbacher and Los (1998) SDA model as below:

$$\text{Technical change}^{3} = (½) \, (\Delta L) \, (f^{0}+f^{1})$$

$$\text{Final demand change} = (½) \, (L^{0}+L^{1}) \, (\Delta f)$$

Where, L is the Leontief inverse[4], L_0 is the base year L matrix, L_1 is the Leontief inverse for the subsequent year, ΔL is the difference between L_0 and L_1, f_0 is the final demand for the base year, f_1 is the final demand for the subsequent year, and Δf is the difference between f_0 and f_1. The sum of the two changes is equivalent to the total changes in output.

For DE, EE and IS coefficients calculation, we used the model of Frank, Kim, & Westphal (1975) as follows:

$$\Delta X = (1 - m_0) \times \Delta D + \Delta E - \Delta m \times \ D_1{}^{5}$$

Here, m_0 is the ratio of imports to domestic demand (M/F), ΔD is the difference between f_0 and f_1, ΔE is the difference between E_0 and E_1, Δm is the difference between m_0 and m_1, $(1-m_0) \times \Delta D$ represents DE coefficient, ΔE represents EE coefficient, and $\Delta m \times D_1$ represents IS coefficient.

For supply-side analysis, we use backward linkage on domestic input or domestic backward linkage (DBL) coefficient and imported backward linkage (IBL) coefficient. We also used vertical specialisation (VS) based on IOTs for supply-side analysis. The models we used for backward linkage (BL) analysis are same as model applied by

---

[3] Please see Miller and Blair (2009) and Dietzenbacher and Los (1998) for detailed mathematical deviation.
[4] The Leontief inverse formula is $(I - A)^{-1}$ where I is the identity matrix and A is the technical coefficient matrix. This inverse ensures $X = (I - A)^{-1}f$, where f is the final demand vector.
[5] Please see Frank, Kim, and Westphal (1975) for detailed methmetical derivation.

Chenery and Watanabe (1958), Hirschman (1958), Jones (1976), and Cella (1984), among others. The models are as below:

$$\text{DBL of sector j} = \sum_{i=1}^{n} Lij$$

$$\text{IBL of sector j} = \sum_{i=1}^{n} lij$$

Here, Lij is the domestic Leontief inverse coefficients and lij is the imported Leontief inverse coefficients.

We use VS to know the domestic content and foreign content of TCI exports. VS is an established concept for trade in value added/supply-side analysis[6]. For our analysis, we apply Hummels, Ishii, & Yi (2001) model, which is given below:

$$\text{VS} = uA^{M}L^{M}X$$

Where, u is a 1 x n vector of 1s, A^{M} is the n x n imported coefficient matrix, L^{M} is the Leontief inverse of the import matrix, X is the diagonal matrix of country exports, and n is the number of sectors. Element a_{ij} of A^{M} denotes the imported inputs from sector i used to produce one unit of sector j's output.

3. Output Structure

In the region, as also in the world, the economy of China is very large, which is 6 times higher than India, 13 times higher than Indonesia, 59 times higher than Viet Nam, and 89 times higher than Bangladesh according to output value at current price in 2011. So, the economy of Bangladesh is the smallest among the clothing makers in the Asian region. In comparison to the year 2000, the output value in 2011 has increased by 7.13 times, 5.61 times, 4.86 times, 4.00 times, and 3.35 times in China, Viet Nam, Indonesia, India, and Bangladesh respectively. Some more information regarding output structure is given in Table 1A in Appendix A.

The Figure 1 below depicted the shares of output of the economies concerned. The industry has played significant role in the economies. It is 68%, 60%, 56%, 50% and

---

[6] See, for example, Timmer, Dietzenbacher, Los, Stehrer, & Vries (2015), Krugman (1995), Feenstra & Hanson (1997), Deardorff (1998), Jones (2001), Dixit and Grossman (1982), and Sanyal (1983), among others.

45% for China, Viet Nam, Indonesia, India and Bangladesh respectively. The contribution of service sector in economies ranges between 24-39%.
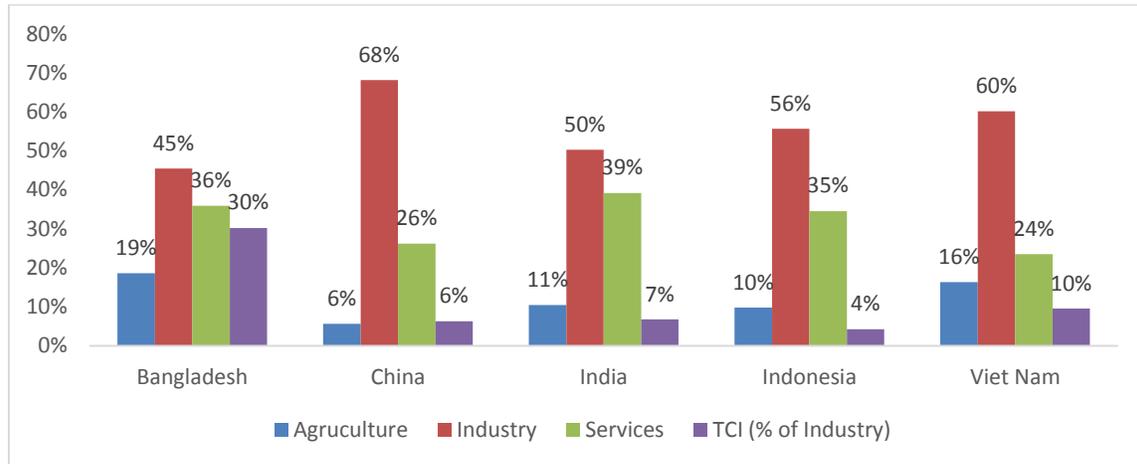
Source: Authors' calculation based on input-output tables 2011.

Figure 1: Agriculture, Industry and Service Shares of the Output.

In the manufacturing structure, the role of TCI is the highest in Bangladesh (30%) followed by Viet Nam(10%), India(7%), China(6%) and Indonesia(4%) as shown in the Figure 1 above. So, the manufacturing sector of Bangladesh is very much dependent on the textile-clothing sector compare to other economies.

4.   Industrial Structure of the Economies

Linkages reflect the dependence of industries on one-another in an economy and measure the potential stimulus that will be induced in other industries arising from an increase in activity in a particular industry (Sim, Secretario, & Suan, 2007). The industry which played the most important roles for the economy can be judged by normalized measures of backward and forward linkages. The normalized measure of backward linkage is known as index of the power of dispersion (IPD) and the normalized measure of forward linkage is known as index of the sensitivity of dispersion (ISD). The IPD coefficients for manufacturing sectors of the economies are shown in the Table 1 below and Table 2A in Appendix A shows more details of IPD and ISD of all sectors. Although the output share of TCI in Bangladesh is the highest but the linkage effect, the effect on the other industries, is not as good as other competitors in Asia. The backward linkage

effect of China is very significant, the strongest among the manufacturing sectors, followed by India (6th), Bangladesh (7th) and Viet Nam (9th). Backward linkage effect of the TCI in Indonesia is not so strong.

Table 1: Normalized Backward Linkage Indices of the Manufacture Sectors.

Ranking	Bangladesh		China		Indonesia		India		Viet Nam	
	I	IPD	I	IPD	I	IPD	I	IPD	I	IPD
1st	3	1.29	4	1.34	3	1.18	10	1.39	6	1.56
2nd	5	1.28	5	1.31	15	1.16	3	1.33	5	1.33
3rd	9	1.26	15	1.31	7	1.14	7	1.30	14	1.32
4th	11	1.26	10	1.28	6	1.11	12	1.30	13	1.32
5th	12	1.25	14	1.24	12	1.11	5	1.30	12	1.31
6th	6	1.19	6	1.22	5	1.10	4	1.29	7	1.25
7th	4	1.19	13	1.21	9	1.09	15	1.26	3	1.24
8th	7	1.12	7	1.20	10	1.08	13	1.25	15	1.23
9th	10	0.98	9	1.17	14	1.04	14	1.24	4	1.21
10th	14	0.86	12	1.16	11	1.04	9	1.23	10	1.21

Source: Authors' calculation based on input-output tables 2011.

Note. I indicates Industry Code; 3 indicates Food, Beverages and Tobacco; 4 indicates Textiles and Textile Products; 5 indicates Leather and Footwear; 6 indicates Wood and Products of Wood and Cork; 7 indicates Pulp, Paper, Printing and Publishing; 8 indicates Coke, Refined Petroleum and Nuclear Fuel; 9 indicates Chemicals and Chemical Products; 10 indicates Rubber and Plastics; 11 indicates Other Non-Metallic Mineral; 12 indicates Basic Metals and Fabricated Metal; 13 indicates Machinery, Nec[7]; 14 indicates Electrical and Optical Equipment; 15 indicates Transport Equipment

The analysis shows that, for Bangladesh case, the most important industries are food, leather, chemicals, non-metallic mineral, metal, wood and textile. The most effective industries for China are textile, leather, transport equipment, rubber, electrical and optical equipment, etc. For Indonesian case, the strong backward linking industries are food, transport equipment, paper, wood, metal, etc. Indian significant industries are rubber, food, paper, metal, leather, textile, etc. The wood, leather, electrical and optical

---

[7] Nec means Not Elsewhere Classified.

equipment, machinery, metal, paper, etc. are the effective industries for Viet Nam. The normalized coefficients of IPD and ISD of all sectors are given in the Table 2A in Appendix A.

5. International Trade Structure of the Asian TCI

The Asian manufacturers-exporters sold the final output of the TCI to the common market, which are the United States (US) and the European Union (EU). Bangladesh exports 79% of clothing exports to US and EU, India exports 60%, Indonesia exports 73%, China exports 44% and Viet Nam exports 68% to these markets. The Table 2 summarizes the export composition of the TCI products. India, Indonesia and China also export fibre, yarn, fabric and chemicals. These intermediate products are traded within the region. Bangladesh imports 28%, China imports 45%, and Viet Nam imports 12% of cotton and fibre from India of their total imports of cotton and fibre. Bangladesh (25%), India (23%), Indonesia (34%) and Viet Nam (30%) import chemicals from China. China also exports yarn to Bangladesh, India, Indonesia and Viet Nam at 41%, 48%, 39% and 45% respectively of the total imports of the same products. Bangladesh also imports chemicals and yarn from India. China satisfies 69%, 67%, 53%, and 53% of fabric demand to Bangladesh, India, Indonesia and Viet Nam respectively. China also satisfies significant portion of the clothing demand by the Asian countries including Bangladesh, India, Indonesia and Viet Nam. The detailed statistics is summarized in annex Table 3A in Appendix A.

Table 2: The international export structure of the Asian TCI exporter-competitors in 2015

Country	Total Export in Billion US$)	Fiber Export	Yarn Export	Fabric Export	Dyes-Chemical Exports	Clothing Exports	Clothing Export to US	Clothing Export to EU
BGD	27	0%	2%	1%	0%	97%	19%	60%
IND	35	8%	16%	16%	7%	53%	22%	38%
IDN	13	5%	17%	14%	3%	61%	54%	19%
CHN	264	1%	4%	26%	3%	66%	20%	24%
VIE	29	1%	11%	6%	0%	82%	53%	15%

Source: Authors' calculation based on UNCTAD database

The Table 3 below shows the imported share of cotton and fibre, yarn, and fabric against export of final product (clothing/apparel)[8]. The statistics shows that Indonesia imported 24% cotton and fibre in 2015 followed by Bangladesh (9%), Viet Nam (7%), India (6%) and China (3%). Compare to the year 2000, the import ratio has increased in Bangladesh and decreased in other countries. China and India also exported high volume of cotton and fibre to other countries. In the year 2015, yarn import ratio of Bangladesh was 10%, which were 8% for Indonesia, 7% for Viet Nam, 6% for India and 5% for China. The import dependency has increased slightly for Bangladesh, India and Indonesia. The fabric import ratio was very high for Viet Nam and Indonesia in 2015. The import dependency of fabric has increased in Indonesia and India by 11% and 5% respectively compare to 2000. The domestic fabric supply ratio for the same period has increased in China (22%) and Bangladesh (13%).

Table 3: Import of Raw Materials against Export of Clothing

Raw Materials	Bangladesh		China		India		Indonesia		Viet Nam	
	2000	2015	2000	2015	2000	2015	2000	2015	2000	2015
Fiber	0.07	0.09	0.05	0.03	0.11	0.06	0.25	0.24	0.11	0.07
Yarn	0.07	0.10	0.08	0.05	0.05	0.06	0.07	0.08	0.13	0.07
Fabric	0.31	0.18	0.28	0.05	0.11	0.16	0.44	0.55	0.63	0.62

Source: Authors' calculation based on UNCTAD database[9]

6. Demand-side of the Industry

The demand-side analysis of the economies shows that around a half of the total output is consumed as intermediate demand. China consumes 60%, Bangladesh consumes 50%, Viet Nam consumes 49%, India and Indonesia consume 40% each. Average export volume in Viet Nam is mentionable, but textile-clothing shares of total exports in Bangladesh is very high compare to other countries. The textile-clothing

---

[8] The textile sector and clothing sector are combined in the input-output tables. But in the real field textile sector supplies input to the clothing sector. We here discuss the textile sector as backward linkage to clothing sector. In the conversion process, cotton and fibre are converted into yarn, yarn is converted into fabric, finally fabric is converted into clothing/apparel.

[9] Data on 'Merchandise trade matrix – detailed products, exports in thousands of dollars, annual, 1995-2015' from UNCTAD

export in Bangladesh is 79%, which is 8.5% on average for other countries. The statistics is shown in Figure 2 below and Table 4A in Appendix A.
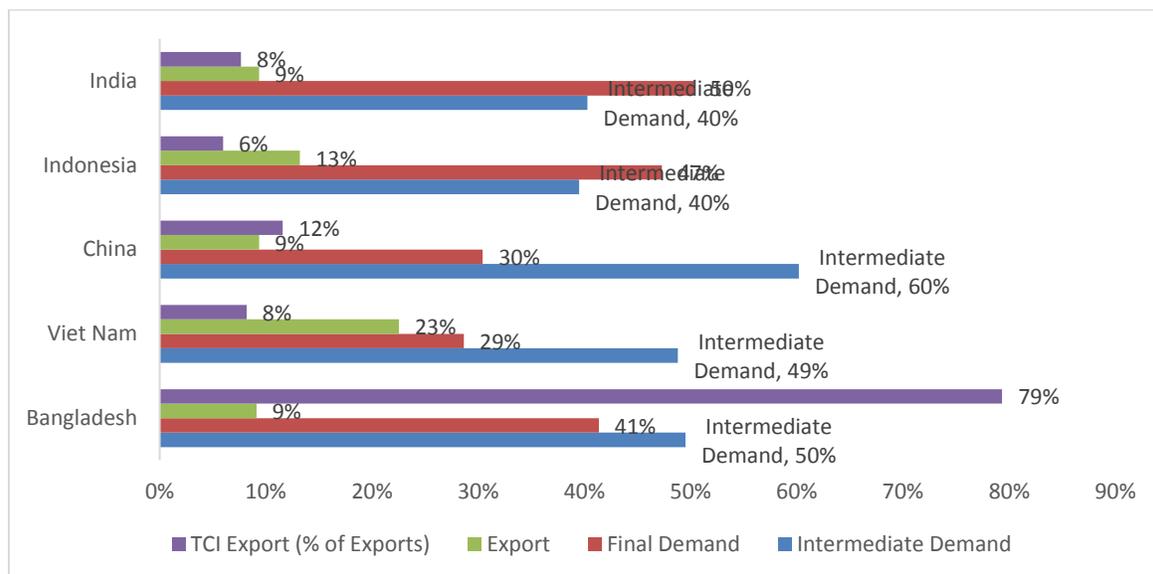
Source: Authors' calculation based on input-output tables 2011.

Figure 2: Demand-side of the Economies in 2011 as Percentage of the Total Demand.

Output Growth Coefficients: The Figure 3 shows the technical effect coefficients of the countries. It shows that China and Viet Nam have positive technical effect on the TCI. On the other hand, India, Bangladesh and Indonesia have 2%, 4% and 25% negative impact respectively on the output growth from 2000 to 2011. As China and Viet Nam is growing fast and moving from low-tech products to high-tech products, their technical effects are positive. After 2000 the production focused more on value-added and branding cultivation through technology upgradation[10] in China (Zhang, Kong, & Ramu, 2016). But the industry in India, Bangladesh and Indonesia is very much labour-intensive.

---

[10]Both horizontal and vertical technology upgradation have taken place. According to Zhang, Kong, & Ramu (2016) *Horizontal Upgradation* includes training provision, new processes & material utilization, adaption to machinery and equipment, inventory control, organizational evolution and *Vertical Technology Upgradation* includes brand creation, participation in upstream and down-stream production, etc.
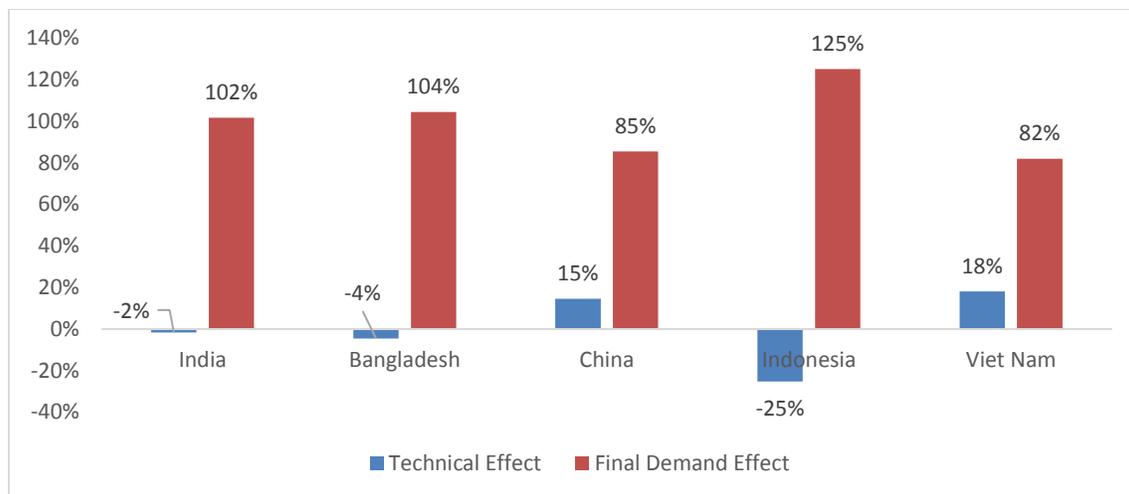
Source: Authors' calculation based on input-output tables 2000 and 2011.

Figure 3: TC Effect and FDC Effect on the TCI from 2000 to 2011.

The final demand thrives the industry in the Asian region. Final demand contributed more towards TCI output changes in Indonesia, Bangladesh and India relatively. For China and Viet Nam, the contributions are 85% and 82% respectively because of high technical effect and movement towards capital-intensive production.

Table 4: Contributions of DE, EE and IS toward Output Change from 2000 to 2011.

Country	Contribution of Domestic Demand Expansion	Contribution of Export Expansion	Contribution of Import Substitution
Bangladesh	0.385	0.614	0.000
Viet Nam	0.545	0.428	-0.027
China	0.680	0.248	-0.072
Indonesia	0.832	0.315	0.147
India	0.899	0.153	0.053

Source: Authors' calculation based on input-output tables 2000 and 2011.

Among the final demand components, export contributed much in the growth path of the TCI outputs. Export contributed 61%, 43%, 32%, 25% and 15% for Bangladesh, Viet Nam, Indonesia, China and India respectively from the year 2000 to 2011. Export-led growth in Bangladesh is much higher than other competitors. Domestic demand expansion has played key role for India, Indonesia, China and Vietnam. Chinese industry was export-led but it is moving to domestic orientation because in 2011 over 80% of the

TCI products "Made in China" are consumed domestically (Lu & Dickson, 2015). Whereas, import substitution played very insignificant roles among the competitors as shown in the Table 4.

7.   Supply-side of the Industries

As we have mentioned early, economy of China is the largest one followed by India, Indonesia, Viet Nam and Bangladesh in accordance with the total demand and supply volume. Out of the total supply, China produces 92% locally, India produces 90% locally, Bangladesh and Indonesia produce 88% locally, and Viet Nam produces 82% domestically. The rest amount is imported. So, China imports the lowest amount and Viet Nam imports the highest amount in the form percentage of total supply in the respective economies. Whereas, China and India import the lowest volume of textile-clothing products (2%). Indonesia, Bangladesh and Vietnam import 5%, 8% and 9% respectively. The statistics is shown in Figure 4 below and Table 4A in Appendix A.
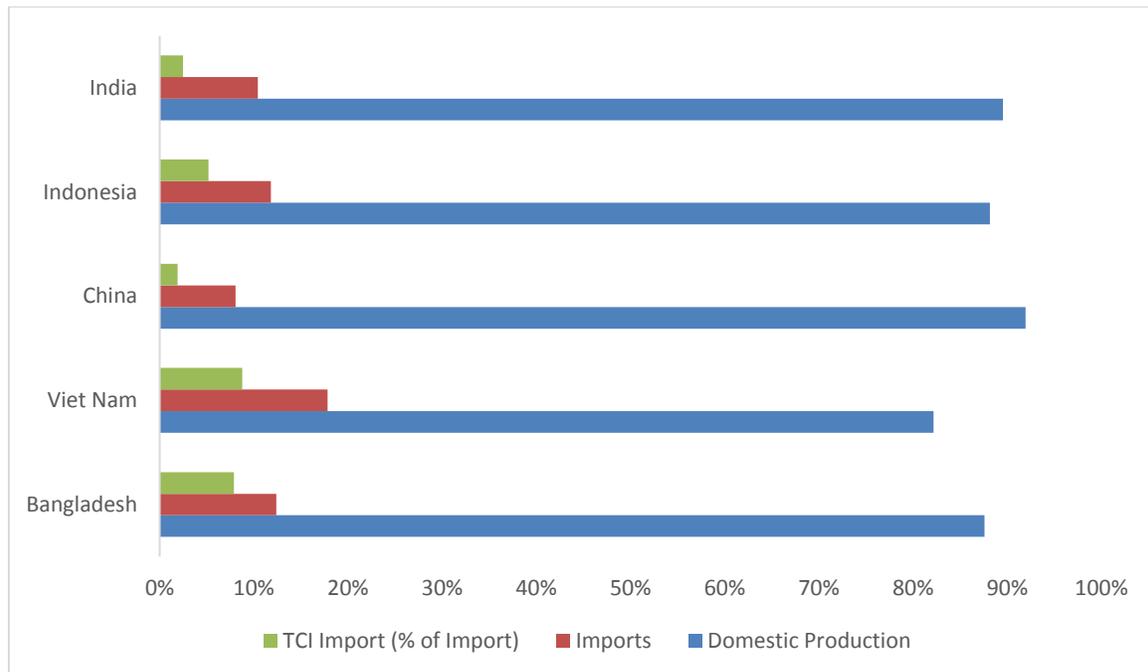
Source: Authors' calculation based on input-output tables 2011.

Figure 4: Supply-side of the Economies in 2011 as Percentage of the Total Supply.

The Vertical Specialization Coefficients: Vertical specialization is the share of value added outside the country-of-completion of the final goods. Intermediate input

trade increases as a result of vertical production network in which countries are specialized in each production stage in the context of international division of labour, otherwise known as vertical specialization (Uchida, 2008). The imported input shares integrated into the export of textile-clothing products of the countries are given in the following Table 5 and details VS for all the 35 sectors are given in the Table 5A in Appendix A.

Table 5: The Share of Vertical Specialization in the TCI exports in 2000 and 2011

Countries	2000	2011
Bangladesh	9.6%	8.5%
China	9.6%	3.8%
India	4.1%	10.7%
Indonesia	18.1%	33.2%
Viet Nam	35.8%	35.4%

Source: Authors' calculation based on input-output tables 2000 and 2011.

Viet Nam imported 35.4% TCI inputs against export of the TCI final goods in 2011 followed by Indonesia (33.2%), India (10.7%), Bangladesh (8.5%) and China (3.8%). The share of imported inputs integrated into exports has increased in Indonesia by 15.1% and in India by 6.6% from 2000 to 2011. The imported share of exports decreased in China by 5.8% and in Bangladesh by 1.1%. The imported input structure of Viet Nam is almost unchanged from 2000 to 2011. Localization of the Chinese TCI is noteworthy, whereas, Indonesian TCI has become more vertical, followed by Indian one.

The Domestic Backward Linkage Effect: A very useful analytical application of I-O tables is backward linkage measurement. The BL quantifies the effect on the whole economy arising from the initial effect of an exogenous change in any of the final demand components. It is the amount by which the initial effect is magnified (or multiplied) to become a total effect (Sim, Secretario, & Suan, 2007). When industry i increases its production, there is an increased demand for inputs from all industries. An industry with higher backward linkages than other industries means that expansion of its production is more beneficial to the economy in terms of causing other induced productive activities (Guo & Planting, 2000).

The BL effect of the TCI on production of other industries in 2000 and 2011 is summarized in the Table 6 and the detailed sector-wise input coefficients are given in the Table 6A in Appendix A. In the year 2011, China (3.09) had the highest domestic BL effect of the TCI on overall industry of the economy. The coefficients for Viet Nam, India, Bangladesh and Indonesia are 2.35, 2.17, 2.14 and 1.60 respectively. The coefficients for Bangladesh and India is very close, but the input effect in Indonesia is very low.

Table 6: The Domestic Backward Linkage Coefficients of the TCI

Countries	2000	2011
China	2.44	3.09
Viet Nam	1.97	2.35
India	2.19	2.17
Bangladesh	2.13	2.14
Indonesia	1.86	1.60

Source: Authors' calculation based on input-output tables 2000 and 2011.

The DBL effect has increased in China, Viet Nam and Bangladesh by 0.65, 0.38 and .02 points respectively. The same effect has decreased in Indonesia and India by 0.26 and .02 points respectively from 2000 to 2011.

The Import Backward Linkage Effect: The IBL can be used to explain economic leakage, which is summarized in the Table 7 for the TCI and the coefficients for all sectors are given in the Table 7A in Appendix A. The IBL analysis shows that the TCI of Viet Nam and Indonesia are very much susceptible to imports in 2000 and 2011. The TCI import repercussion effect of Indonesia has increased over time, whereas, the domestic effect has declined.

Table 7: The Import Backward Linkage Effect of the TCI

	2000	2011
China	1.10	1.04
Viet Nam	1.36	1.35
India	1.04	1.11
Bangladesh	1.10	1.08
Indonesia	1.18	1.33

Source: Authors' calculation based on input-output tables 2000 and 2011.

8.   Competitiveness among the Economies

The Asian textile-clothing exporters have been major beneficiaries of freer world of trade in textiles since the Agreement on Textile and Clothing replacing Multi-Fibre Arrangement in 1994, which fully implemented from 2005 under WTO multilateral trading system. Asian TCI manufacture-exporters were afraid of Chinese competition because of end of quota system. But the imposition of safeguard quotas on China in 2006 by the United States (US) and generalized system of preference facility by European Union help other Asian exporters grow faster. Moreover, Viet Nam was under US quotas negotiated in 2003 until it become a member of the WTO in the late 2006 (James, 2008).

James (2008) assessed the competitiveness of the Asian exporters, which shown in the following Table 8 below. His work revealed that revealed comparative advantage (RCA) index of Bangladesh for clothing export is much higher than Viet Nam, China, India and Indonesia. On the other hand, RCA index for textile is higher for India than China, Indonesia, Bangladesh and Viet Nam. The unit price calculation shows that Bangladesh supplies the lowest cost clothing to the US market followed by China, Viet Nam, Indonesia and India.

Table 8: The RCA Indices for the TCI Products of the Asian Competitors

Country	Clothing RCA Index in 2005	Textile RCA Index in 2005	Clothing Unit Value to the US Market (US$) in 2007
Bangladesh	27.31	1.30	2.34
India	3.21	3.90	4.27
Indonesia	2.19	2.00	3.86
Viet Nam	5.63	1.05	3.85
China	3.60	2.69	3.09

Source: James (2008)

We analyse the competitive position of the TCI of the economies based on demand-supply indicators, which are summarized in the following Table 9. The technical change coefficient, domestic demand expansion coefficient, export expansion coefficient and import substitution coefficient are demand-side indicators. Whereas, index of the

power of dispersion, index of the sensitivity of diversion, domestic backward linkage coefficients and vertical specialization coefficients are used as supply-side indicators.

Competitiveness must include an analysis of the transformation process of inputs into outputs. factors such as technical change, which determine the ultimate gains or losses in productivity, which in turn determine international competitiveness (Fransman,1986). In this paper, the technical change effect is higher in Viet Nam than China, Indonesia, Bangladesh and India. So, the technology impact is the lowest in India and the highest in Viet Nam.

Export expansion has positive relationship with the development of a developing country, which was important in explaining the intercountry variance in GDP growth rates (Tyler, 1981). In this analysis, we find that contribution of export expansion is the highest in Bangladesh, whereas, Viet Nam, Indonesia, China, and India are the followers. But, in recent study, it is concluded that domestic demand expansion makes the industry sustainable. So, Indian TCI is more sustainable than Indonesia, China, Viet Nam and Bangladesh.

In sum, considering the 2000 to 2011 period, the demand-side competitiveness of Viet Nam is the strongest in the region followed by China, India, Bangladesh and Indonesia.

Table 9: Competitive Ranking based on Demand-Supply Indicators of the Economies.

Indicators	BGD	CHN	IDN	IND	VIE
TE Coefficient (rank)	-0.04(4)	0.15(2)	-0.25(5)	-0.02(3)	0.18(1)
DE Coefficient (rank)	0.385(5)	0.68(3)	0.832(2)	0.899(1)	0.545(4)
EE Coefficient (rank)	0.614(1)	0.248(4)	0.315(3)	0.153(5)	0.428(2)
IPD Coefficient (rank)	1.19(4)	1.34 (1)	1(5)	1.29(2)	1.21(3)
ISD Coefficient (rank)	1.06(3)	1.37(2)	0.8(5)	0.87(4)	1.47(1)
DBL Coefficient (rank)	2.14(4)	3.09(1)	1.6(5)	2.17(3)	2.35(2)
VS Coefficient (rank)	0.09(2)	0.04(1)	0.11(3)	0.33(4)	0.35(5)

Source: Authors' calculations

Note. BGD stands for Bangladesh, CHN stands for China, IDN stands for Indonesia, IND stands for India and VIE stands for Viet Nam. These acronyms are also used in NIOTs.

Backward and forward linkages are competitive factors. The backward linkages may strengthen supply industries, this in turn feeding (via forward linkages) to other local firms. Linkage effects to supplier industries may reduce input costs (Markusen & Venables, 1999). So, strong linkages make the industry competitive in the global market. The results in this paper show that China has the strongest position in normalized backward effect measure followed by India, Viet Nam, Bangladesh and Indonesia. In DBL analysis, it shows that except exchanges position of India and Viet Nam all other countries correspond the same ranking as IPD coefficients.

On the other hand, the VS coefficients show that position of China is the top and the order of other countries are Bangladesh, Indonesia, India and Viet Nam. Here we consider that the low VS rate is better for the developing countries, which reduces import cost and increases employability. Vertical specialization reduces, in some cases, production cost. But, an increase in comparative advantage is not necessarily associated with an increase in specialization (Ricci, 1999). In case of the TCI in the Asian region, the low rate of VS ensures high competitiveness.

So, in general, if we rank the competitiveness based on supply-side indicators, we can infer that China, Viet Nam, India, Bangladesh and Indonesia are competitive, respectively, in the TCI.

9.   Conclusions

The TCI was a very important industry for early industrialization of the developed economies like UK, US, Japan, etc. This industry is now a very significant industry for the major Asian economies, which are on the verge of industrialization. This paper is introduced to analyze the TCI of the top five manufacturer-exporters in Asia from demand-supply aspects in the input-output framework and to confer the competitiveness of the countries based on demand-supply indicators. We used MRIO of ADB and NIOTs of WIOD for the year 2000 and 2011 for input-output analysis and structural decomposition analysis to answer our research questions.

We used the technical change contribution, final demand change contribution, export expansion, import substitution and domestic demand expansion for demand-side analysis of the industry. Though the economy of China is very bigger and clothing

export figure is very big compare to other countries, the demand-side structure is weaker than Viet Nam in recent times. Technical change analysis shows that Viet Nam is advanced to China. Viet Nam's movement towards high value added products is mentionable. The TCI of India, Bangladesh and Indonesia is very much labor-intensive and producing low value added products. This result resembles with the past experiences such as UK, Germany, US, Japan, Korea, Taiwan, Hong Kong, etc. which were moved to labour-intensive to capital intensive, low value added to high value added textile-clothing production. Final demand contributed much for the countries which are producing low value added products like Indonesia, Bangladesh and India. Among final demand components, export expansion played extraordinary roles for Bangladesh and Viet Nam. Whereas, domestic demand expansion contributed much for China, India and Indonesia after 2000. Except Indonesia, import substitution has no significant effect on the growth of the TCI. Thus, based on the result of the demand side indicators, we rank Viet Nam as the most competitive country in the region. China, India, Bangladesh and Indonesia are the rest competitive countries respectively in the demand-side.

Whereas, the key supply-side determinants are backward linkage coefficients, vertical specialization coefficients and normalized linkage measures. The backward linkage analysis shows that domestic linkage effect of China is 1.9 times higher than Indonesia, 1.4 times higher than Bangladesh and India, 1.3 times higher than Viet Nam in 2011. So, domestically the industry is very much stronger than other Asian manufacturers of textile-clothing products. When we analyse the economic leakage of the TCI for 2011, we find the highest leakage is in Viet Nam followed by Indonesia, India, Bangladesh and China. The vertical specialization rates say that the TCI exports of Viet Nam used the highest amount of imported inputs. The VS rates resemble with the economic leakage in 2011. In sum, the supply-side parameters clearly indicate that China is the strongest textile-clothing manufacturers in the Asian region and no doubt in the global economy as well. Supply-side indicators also rank Viet Nam, India, Bangladesh and Indonesia are the rest textile-clothing manufacturers in the Asian region.

Based on overall demand-side and supply-side indicators, the competitive ranking of the countries are China, Viet Nam, India, Bangladesh and Indonesia respectively from high competitive to low competitive ones.

References

Ahmed, R. (2013). An analysis of the change and volatility in the apparel industry of Bangladesh after MFA era. *Journal of Textile and Apparel Technology and Management, 8*(1), 1-11.

Antoshak, R. (2006). U.S.-China textile agreement: A case of diminished returns. *Cotton Grower, 42*(3), 34-35.

Anubhai, P., & Mote, V. L. (1994). India's textile industry: A case study of subsectoral restructuring. In S.D. Meyanathan (Ed.), *Managing restructuring in the textile and garment subsector: Examples from Asia*. The World Bank Publications.

Asian Development Bank. (2015). *Highlights of Asian economic integration report 2015.* Manila: Asian Develpment Bank.

Asian Foundation. (2012). The competitiveness of export enterprises in three sectors: garment and textiles, fisheries and electronics in Vietnam. Hanoi, Vietnam: Center Institute for Economic Management.

Bhattacharya, D., & Rahman, M. (1999). *Female employment under export-propelled industrialization: Prospects for internalizing global opportunities in Bangladesh's apparel sector, UNRISD Occasional Paper, No. 10.* Geneva: The United Nations Research Institute for Social Development.

Bhattacharya, J., & Raychaudhuri, A. (1994). A study on international competitiveness of India's exportables, 1971–1990. Working Paper No. 20 (September). Jadavpur University: Department of Special Assistance Centre for Regional Economic Studies.

Breda, E., Cappariello, R., & Zizza, R. (2005). *Vertical specialization in Europe:Evidence from the import content of exports.* Rome: Bank of Italy.

Bridgman, B. (2012). The rise of vertical specialization trade. *Journal of International Economics, 86*(1), 133-140.

Cao, F. (2012). Analysis of the international trade competitiveness of china's textile and apparel industries in post-quota era-an empirical analysis based on the intra-industry trade. *Journal of Chongqing Technology and Business University*, Social Science Edition, 2012-06.

Cella, G. (1984). The input–output measurement of interindustry linkages. *Oxford Bulletin of Economics and Statistics*, *46I*(1), 73–84.

Chatterjee, S., & Mohan, R. (1993). India's garment exports. *Economic and Political Weekly*, *28*(35), M95-M119.

Chen, W., Lau, C. K., Boansi, D., & Bilgin, M. H. (2016). Effects of trade cost on the textile and apparel market: Evidence from Asian countries. *The Journal of The Textile Institute, 0*(0), 1-16. doi:10.1080/00405000.2016.1206459

Chenery, H., & Watanabe, T. (1958). International comparisons of the structure of production. *Econometrica, 26*(4), 487–521.

Chi, T., & Kilduff, P. (2006). An assessment of trends in China's comparative advantages in textile machinery, man-made fibers, textiles and apparel. *The Journal of The Textile Institute, 97*(2), 173-191. doi:10.1533/joti.2005.0159

Cooper, W. (2013). A fresh look at the US/Chanese textile and apparel supply chain question. *Journal of Textile and Apparel, Technology and Management, 8*(2), 1-16.

Dang, T.T.N., & Dinh, C.K. (2011). Policy research brief: Vietnam's garment and textiles value chain Ho Chi Minh. Fullbright, Vietnam

Deardorff, A. (1998). Fragmentation in simple trade models. *The North American Journal of Economics and Finance 12*(2),121-137.

Dietzenbacher, E., & Los, B. (1998). Structural decomposition techniques: Sense and sensitivity. *Economic Systems Research*, *10*(4), 307–324.

Dixit, A.K., & Grossman, G.M. (1982). Trade and protection with multistage production. *Review of Economic Studies 49*(4), 583–594.

Elbehri, A., Hertel, T., & Martin, W. (2003). Estimating the impact of WTO and domestic reforms on the Indian cotton and textile sectors: A general equilibrium approach. *Review of Development Economics, 7*(3), 343–359.

ElSayed, A. A., Kulich, R., Lake, L., & Megahed, S. (2006). The Chinese apparel cluster in Guangdong. Harvard Business School.

Esho, H. (2015). Dynamics of the textiles & apparel industries in Southeast Asia— A preliminary analysis. *Journal of International Economic Studies, 29*(1), 85-106.

Feenstra, R.C., & Hanson, G.H. (1997). Foreign direct investment and relative wages: Evidence from Mexico's maquiladoras. *Journal of International Economics 42*, 371–394.

Frank, C. R., Kim, K. S., & Westphal, L. E. (1975). *Foreign trade regimes and economic development: South Korea*. New York, NY: National Bureau of Economic Research.

Frankel, J. A., & Wei, S.-J. (1995). The new regionalism and Asia: Impact and options. *Emerging Global Trading Environment and Developing Asia*. Manila: Asian Development Bank.

Fransman, M. (1986). International competitiveness, technical change and the state: The machine tool industry in Taiwan and Japan. *World Development, 14*(12), 1375-1396.

Ganesh, S. (2002). Indian textile industry: Stifled by warped policies. *Economic and Political Weekly, 37*(12), 1095–1099.

Gherzi Report. (2003). Benchmarking of costs of production of textile products in India vis-à-vis China, Pakistan, Indonesia, Bangladesh and Sri Lanka. Switzerland: Swiss Textile Organization.

Goedhuys, M., Janz, N., & Mohnen, P. (2013). Knowledge-based productivity in "low-tech" industries: Evidence from firms in developing countries. *Industrial and Corporate Change, 23*(1), 1-23. doi:10.1093/icc/dtt006

Goto, K. (2013). Starting businesses through reciprocal informal subcontracting: Evidence from the informal garment industry in ho chi minh city. *Journal of International Development 25*(4),562–582.

Goto, K., Natsuda, K., & Thoburn, J. (2011). Meeting the challenge of China: the Vietnamese garment industry in the post MFA era. *Global Networks*, *11*(3), 355-379.

Guo, J., & Planting, M. A. (2000). Using input-output analysis to measure U.S. economic structural change over a 24 year period. *The 13th International Conference on Input-Output Techniques*. Macerata, Italy: International Input-Output Association.

Heron, T. (2006). The ending of the multifibre arrangement: A development boon for the South? *The European Journal of Development Research, 18*(1), 1-21.

Hill, E. W., & Brennan, J. F. (2000). A methodology for identifying the drivers of industrial clusters: The foundation of regional competitive advantage. *Economic Development Quarterly, 14*(1), 65-96.

Hirschman, A. O. (1958). *The strategy of economic development*. New Haven, CT: Yale University Press.

Hummels, D., Ishii, J., & Yi, K.-M. (2001). The nature and growth of vertical specialization in the world trade. *Journal of International Economics, 54*(1), 75-96.

Huq, F. A., Stevenson, M., & Zorzini, M. (2014). Social sustainability in developing country suppliers: An exploratory study in the ready made garments industry of Bangladesh. *International Journal of Operations & Production Management, 34*(5), 610 - 638.

James, W. E. (2008). *Asian textile and apparel trade: Moving forward with regional integration.* Manila: Asian Development Bank

James, W. E., Ray, D. J., & Minor, P. J. (2002). *Indonesia's textile and apparel industry: Meeting the challenges of the changing international trade environment.* Kitakyushu: The International Centre for the Study of East Asian Development.

James, W.E., Ray, D.J., & Minor, P.J. (2003). Indonesia's textile and apparel: The challenges ahead. *Bulletin of Indonesian Economic Studies, 39*(1), 93–103.

Jiang, X., & Milberg, W. (2012). *Vertical specialization and industrial upgrading: A preliminary note (Working paper 10).* Capturing the Gains (DFIP Trade Policy Unit).

Jones, L. P. (1976). The measurement of Hirschmanian linkages. *Quarterly Journal of Economics*, *90*(2), 323–333.

Jones, R.W. (2001). Globalization and the fragmentation of production. *Seoul Journal of Economics, 14*(1), 1-13.

Kar, M. (2012). National and global aspects of India's textiles and apparel industry and trade: An overview. *South Asian Journal of Macroeconomics and Public Finance, 1*(1), 81-133. doi:10.1177/227797871200100106

Kathuria, S., & Bharadwaj, A. (1998). Export quotas and policy constraints in the Indian textile and garment industries. Washington, DC: The World Bank Publications.

Kim, J.-O., Traore, M. K., & Warfield, C. (2006). The textile and apparel industry in developing countries. *Textile Progress, 38*(3), 1-64. doi:10.1533/tepr.2006.0003

Knutsen, H.M. (2004). Industrial development in buyer-driven networks: the garment industry in Vietnam and Sri Lanka. *J Econ Geogr, 4* (5), 545-564.

Krugman, P.R. (1995). Growing world trade: Causes and consequences. *Brookings Papers on Economic Activity 1*, 327–377.

Kuncoro, M. (2013). Indonesia's textile and its products industry: Recent development and challenges. *The Business & Management Review, 4*(2), 126-139.

Lin, H. L., Li, H. Y., & Yang, C. H. (2011). Agglomeration and productivity: Firm-level evidence from China's textile industry. *China Economic Review, 22*(3), 313-329.

Lu, S., & Dickson, M. A. (2015, 7 24). *Where is China's textile and apparel industry going?* Retrieved from The University of Nottingham China Policy Institute: https://cpianalysis.org

Markusen, J. R., & Venables, A. J. (1999). Foreign direct investment as a catalyst for industrial development. *European Economic Review, 43*(1999), 335-356.

Miller, R., & Blair, P. (2009). *Input–output analysis: Foundations and extensions*. New York, NY: Cambridge University Press.

Nadvi, K., Thoburn, J., Thang, B.T., Ha, N.T.T., Hoa, N.T., & Le, D.H. (2004). Challenges to Vietnamese firms in the world garment and textile value chain, and the implications for alleviating poverty. *Journal Of The Asia Pacific Economy*, *9*(2), 249-267.

Nauly, Y. D. (2013). *The impact of import competition on indonesia's textile and apparel industries: A dilemma between employment and efficiency.* Oita: Ritsumeikan Asia Pacific University.

Puga, D., & Venables, A. J. (1999). Agglomeration and economic development: Import substitution vs. trade liberalisation. *The Economic Journal, 109*(455), 292-311.

Rasmussen, P. N. (1957). *Studies in inter-sectoral relations*. Amsterdam, Netherlands: North Holland Publishing Company.

Ricci, L. A. (1999). Economic geography and comparative advantage: Agglomeration versus specialization. *European Economic Review, 43*(1), 357-377.

Roy, T. (1999). The textile industry. In A. Sen, R. Baidya, & S. Gokarn (Eds), *Structure of Indian industry*. New Delhi: Oxford University Press.

Ruan, J., & Zhang, X. (2014). "Flying geese" in China: The textile and apparel industry's pattern of migration. *Journal of Asian Economics, 34*(October), 79-91.

Sanyal, K.K. (1983). Vertical specialization in a Ricardian model with a continuum of stages of production. *Economica 50*(197), 71–78.

Shen, D. (2008). What's happening in china's textile and clothing industries? *Clothing & Textiles Research Jouranl, 26*(3), 203-222. doi:10.1177/0887302X07313941

Shippen, B. S. (1999). Labor market effects of import competition: Theory and evidence from the textile and apparel industries. *Atlantic Economic Journal, 27*(2), 193-200.

Sim, B., Secretario, F., & Suan, E. (2007). *Developing an interregional input–output table for cross-border economies: An application to Lao and Thailand.* Manila: Asian Development Bank.

Sonobe, T., Hu, D., & Otsuka, K. (2002). Process of cluster formation in China: A case study of a garment town. *The Journal of Development Studies, 39*(1), 118-139.

Taplin, I. M. (2014). Global commodity chains and fast fashion: How the apparel industry continues to re-invent itself. *Competition and Change, 18*(3), 246–264. doi:10.1179/1024529414Z.00000000059

Taplin, I. M. (2014). Who is to blame?A re-examination of fast fashion after the 2013 factory disaster in Bangladesh. *Critical Perspectives on International Business, 10*(1/2), 72 - 83. doi:10.1108/cpoib-09-2013-0035

Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R., & Vries, G. J. (2015). An illustrated user guide to the world input-output database: The case of global automotive production. *Review of International Economics, 23*(3), 575-605.

Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R., & Vries, G. J. (2015). An illustrated user guide to the world input-output database:The case of global automotive production. *Review of International Economics, 23*(3), 575-605.

Tran, A. N. (2012). Vietnamese textile and garment industry in the global supply chain: State strategies and workers' responses. *Institutions and Economies, 4*(3), 123-150.

TYLER, W. G. (1981). Growth and export expansion in developing countries: Some empirical evidence. *Journal of Development Economics, 9*(1), 121-130.

Uchida, Y. (2008). Vertical specialization in East Asia: Some evidence from East Asia using Asian international input-output tables from 1975 to 2000. In Hiratsuka, & Uchida, *Vertical Specialization and Economic Integration in East Asia* (pp. 1-28). Tokyo: IDE-JETRO.

Vu, H. T., & Pham, L. C. (2016). A dynamic approach to assess international competitiveness of Vietnam's garment and textile industry. *Vu and Pham SpringerPlus, 5*(203), 1-13. doi:10.1186/s40064-016-1912-3

World Trade Organization. (2017, 1 12). *International trade statistics 2014: Merchandise trade*. Retrieved from WTO Website: https://www.wto.org/

Zhang, M., Kong, X. X., & Ramu, S. C. (2016). The transformation of the clothing industry in China. *Asia Pacific Business Review*, *22*(1), 86-109.

Zhang, M., Kong, X. X., & Ramu, S. C. (2016). The transformation of the clothing industry in China. *Asia Pacific Business Review, 22*(1), 86-109. doi:10.1080/13602381.2014.990204

Zhang, T., Ling, J., Zhang, S., & Wang, Y. (2014). Ecology dynamics model on Chinese apparel industry cluster. *The Journal of The Textile Institute, 105*(8), 867-877. doi:10.1080/00405000.2013.861148

Appendix A

Table 1A: Output structure of the Economies

	Bangladesh			Viet Nam			China			Indonesia			India		
	billion US$	%	Change since 2000(x)	billion US$	%	Change since 2000(x)	billion US$	%	Change since 2000(x)	billion US$	%	Change since 2000(x)	billion US$	%	Change since 2000(x)
Agriculture*	47	19%	3.34	61	16%	4.00	1261	6%	4.11	162	10%	4.44	379	11%	2.86
Industry*	114	45%	3.47	226	60%	6.76	15172	68%	7.89	923	56%	4.83	1815	50%	4.10
Services*	90	36%	3.20	88	24%	4.85	5838	26%	6.51	573	35%	5.04	1415	39%	4.33
Total Output	**250**	**100%**	3.35	375	100%	5.61	22271	100%	7.13	1659	100%	4.86	3610	100%	4.00
TCI*	34	14%	3.29	22	6%	6.78	960	4%	6.36	39	2%	2.31	123	3%	2.87
TCI**		30%	-		10%	-		6%	-		4%	-		7%	-

*% of total output, ** % of industry output

Source: Authors' calculation based on input-output tables 2000 and 2011 of the respective countries

Table 2A: IPD and ISD coefficients of all sectors of the Economies

Sector	Bangladesh		China		Indonesia		India		Viet Nam	
	IPD	ISD	IPD	ISD	IPD	ISD	IPD	ISD	IPD	ISD
1	1.11	2.86	0.81	1.77	0.82	1.92	0.79	1.63	0.97	1.98
2	0.98	0.82	0.93	1.66	0.75	2.46	0.81	1.02	0.70	1.05
3	1.29	1.08	1.11	1.45	1.18	1.56	1.33	0.82	1.24	1.10
4	1.19	1.06	1.34	1.37	1.00	0.80	1.29	0.87	1.21	1.47
5	1.28	0.79	1.31	0.70	1.10	0.68	1.30	0.78	1.33	0.83
6	1.19	0.68	1.22	0.99	1.11	0.92	1.07	0.69	1.56	1.18
7	1.12	0.82	1.20	1.16	1.14	0.99	1.30	0.99	1.25	1.41
8	0.73	0.56	0.86	1.18	0.88	0.72	1.09	1.59	1.16	0.53
9	1.26	1.15	1.17	2.21	1.09	1.30	1.23	1.40	1.16	1.22
10	0.98	0.64	1.28	1.11	1.08	0.73	1.39	0.93	1.21	1.41
11	1.26	0.84	1.14	0.77	1.04	0.69	1.18	0.79	1.16	1.47
12	1.25	1.87	1.16	2.16	1.11	0.64	1.30	1.83	1.31	0.88
13	0.82	0.62	1.21	1.12	0.94	0.64	1.25	0.85	1.32	1.39
14	0.86	0.97	1.24	1.60	1.04	0.85	1.24	0.76	1.32	2.14
15	0.79	0.73	1.31	1.15	1.16	1.22	1.26	0.91	1.23	1.17
16	0.80	0.69	1.08	0.49	1.14	0.69	0.87	0.70	1.15	0.82
17	0.91	0.69	1.12	1.65	1.14	1.12	1.18	1.44	0.82	1.45
18	1.16	0.94	1.23	0.51	1.11	1.09	1.17	1.26	1.05	0.68
19	1.03	0.57	0.43	0.43	0.63	0.63	0.69	0.68	0.89	0.54
20	0.80	1.56	0.79	1.13	0.99	1.55	0.69	1.23	0.87	0.56
21	0.76	2.12	0.79	0.58	0.99	1.25	0.69	1.64	0.70	1.83
22	1.32	0.67	1.03	0.84	1.04	0.93	1.11	0.71	0.99	0.76
23	0.87	1.63	0.88	0.92	1.10	1.10	1.14	2.09	0.83	0.78
24	1.04	0.65	0.94	0.63	1.11	0.67	0.97	0.62	0.94	0.55

25	1.12	0.61	1.13	0.50	1.01	0.82	0.95	0.63	1.04	0.54
26	0.91	0.58	0.97	0.58	0.81	0.66	1.05	0.73	0.79	0.80
27	0.89	0.98	0.81	0.69	0.93	1.31	0.85	0.92	0.76	0.66
28	0.91	1.07	0.69	1.15	0.82	1.07	0.79	1.70	0.62	0.84
29	0.79	1.20	0.58	0.67	0.97	1.26	0.68	0.60	0.65	1.27
30	1.07	0.64	1.02	1.14	1.00	0.64	0.83	0.99	0.82	0.81
31	0.94	0.73	0.87	0.44	1.01	0.71	0.59	0.59	0.73	0.54
32	0.88	0.55	0.84	0.51	1.07	0.72	0.68	0.60	0.69	0.54
33	0.96	0.88	1.08	0.49	1.05	0.68	0.89	0.60	0.92	0.54
34	0.87	1.65	0.97	0.79	1.03	1.37	0.67	0.79	0.78	0.68
35	0.85	1.10	0.43	0.43	0.63	0.63	0.67	0.61	0.80	0.58

Source: Authors' calculation from input-output tables 2000 and 2011 of the respective countries

Note: Sector Coding for the above Table is as follows. 1 = Agriculture, Hunting, Forestry and Fishing; 2 = Mining and Quarrying; 3 = Food, Beverages and Tobacco; 4 = Textiles and Textile Products; 5 = Leather and Footwear; 6 = Wood and Products of Wood and Cork; 7 = Pulp, Paper, Paper , Printing and Publishing; 8 = Coke, Refined Petroleum and Nuclear Fuel; 9 = Chemicals and Chemical Products; 10 = Rubber and Plastics; 11 = Other Non-Metallic Mineral; 12 = Basic Metals and Fabricated Metal; 13 = Machinery, Nec; 14 = Electrical and Optical Equipment; 15 = Transport Equipment; 16 = Manufacturing, Nec; 17 = Electricity, Gas and Water Supply; 18 = Construction; 19 = Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; 20 = Wholesale Trade; 21 = Retail Trade; 22 = Hotels and Restaurants; 23 = Inland Transport; 24 = Water Transport; 25 = Air Transport; 26 = Other Transport Activities; 27 = Post and Telecom; 28 = Financial Intermediation; 29 = Real Estate; 30 = Renting of M&Eq and Other Business Activities; 31 = Public Admin and Defence; 32 = Education; 33 = Health and Social Work; 34 = Other Community Services; 35 = Private Households with Employed Persons.

Table 3A: The TCI Products Import Export Matrix of the Asian Manufacturers in 2015

Figures are in Million US$

Cotton and Fibre									
	BGD	IND	IDN	CHN	VIE	US	EU	Row	Total Export
BGD		13	1	32	1	4	7	18	76
IND	717	-	70	435	185	86	187	1,075	2,755
IDN	23	32	-	83	31	38	61	346	615
CHN	58	108	167	-	92	296	161	1,171	2,052
VIE	0	0	17	117	-	19	49	71	273
US	244	208	340	2	389	US, EU, and Row are not considered as reporting countries.			
EU	66	126	55	168	16				
Row	1,492	487	1,247	132	784				
Total Import	2,600	973	1,895	970	1,498				
Dyes and Chemicals									
	BGD	IND	IDN	CHN	VIE	US	EU	Row	Total Export
BGD		3	0	0	0	0	0	1	5
IND	156	-	86	94	31	223	575	1,327	2,492
IDN	12	50	-	28	14	20	20	203	347
CHN	139	415	401	-	341	615	957	4,671	7,539
VIE	0	6	12	17	-	8	25	72	141
US	2	194	29	16	32	US, EU, and Row are not considered as reporting countries.			
EU	53	414	140	235	88				
Row	185	710	504	235	637				
Total Import	547	1,792	1,172	626	1,142				

Yarn									
	BGD	IND	IDN	CHN	VIE	US	EU	Row	Total Export
BGD		57	9	83	1	10	45	368	573
IND	653	-	57	1,678	114	99	570	2,507	5,678
IDN	71	40	-	220	71	122	249	1,451	2,224
CHN	790	517	264	-	740	520	1,125	7,149	11,105
VIE	28	63	69	1,571	-	26	69	1,235	3,060
US	4	25	5	261	3				
EU	8	56	14	302	13	US, EU, and Row are not considered as reporting countries.			
Row	352	317	255	4,388	698				
Total Import	1,906	1,075	674	8,503	1,639				
Fabric									
	BGD	IND	IDN	CHN	VIE	US	EU	Row	Total Export
BGD		45	2	7	2	45	39	89	229
IND	653	-	65	60	91	378	561	3,555	5,364
IDN	44	31	-	66	75	66	144	1,337	1,763
CHN	4,087	2,128	2,736	-	9,240	3,297	5,394	41,918	68,801
VIE	19	20	115	118	-	302	83	982	1,638
US	9	63	28	421	81				
EU	30	168	91	1,187	157	US, EU, and Row are not considered as reporting countries.			
Row	1,058	718	2,112	7,674	7,744				
Total Import	5,899	3,173	5,149	9,532	17,393				
Machinery									
	BGD	IND	IDN	CHN	VIE	US	EU	Row	Total Export

	BGD	IND	IDN	CHN	VIE	US	EU	Row	Total Export
BGD		0	0	0	0	0	0	2	2
IND	63	-	39	16	37	13	94	210	472
IDN	1	2	-	0	9	0	2	21	35
CHN	441	781	268	-	586	1,082	501	2,959	6,619
VIE	0	9	1	22	-	79	70	185	367
US	26	21	6	48	6		US, EU, and Row are not considered as reporting countries.		
EU	216	702	202	1,984	104				
Row	400	683	328	1,291	467				
Total Import	1,147	2,197	845	3,362	1,210				
Clothing									
	BGD	IND	IDN	CHN	VIE	US	EU	Row	Total Export
BGD		89	7	282	1	5,036	15,793	4,937	26,144
IND	54	-	8	89	1	3,940	6,878	7,199	18,168
IDN	1	13	-	99	12	4,273	1,479	2,029	7,905
CHN	232	868	796	-	4,586	35,787	41,226	91,207	174,702
VIE	0	7	11	549	-	12,444	3,604	6,842	23,459
US	2	11	6	43	9		US, EU, and Row are not considered as reporting countries.		
EU	11	110	61	1,695	25				
Row	254	317	325	3,649	673				
Total Import	555	1,413	1,214	6,406	5,307				

Note: BGD stands for Bangladesh, IND stands for India, IDN stands for Indonesia, CHN stands for China, VIE stands for Viet Nam, US stands for United States of America, EU stands for 29 countries' European Union, Row stands for Rest of the World.
Source: Authors' calculation based on UNCTAD statistics

Table 4A: The Demand-Supply Aggregated Elements of the Economies

	Bangladesh			Viet Nam			China			Indonesia			India		
	billion US$	%	Change since 2000(%)	billion US$	%	Change since 2000(%)	billion US$	%	Change since 2000(%)	billion US$	%	Change since 2000(%)	billion US$	%	Change since 2000(%)
Total Supply	**250**			**375**			**22,271**			**1,659**			**3,610**		
Production (% of Total)	219	88%	2.32	308	82%	4.61	20,480	92%	6.09	1,463	88%	3.98	3,233	90%	2.87
Imports (% of Total)	31	12%	2.55	67	18%	4.59	1,791	8%	6.63	196	12%	3.14	377	10%	4.65
TCI (% of Import)	2	8%	1.66	6	9%	6.04	34	2%	1.57	10	5%	2.88	9	2%	4.83
Total Demand	**250**			**375**			**22,271**			**1,659**			**3,610**		
Intermediate (% of Total)	124	50%	3.95	183	49%	6.15	13,408	60%	6.71	655	40%	4.11	1,455	40%	2.91
Final (% of Total)	103	41%	1.39	107	29%	2.94	6,777	30%	5.13	785	47%	4.31	1,817	50%	2.93
Export (% of Total)	23	9%	2.53	85	23%	5.03	2,086	9%	6.46	219	13%	2.35	338	9%	3.99
TCI Export (% of Exports)	18	79%	3.17	7	8%	4.67	242	12%	4.21	13	6%	0.56	26	8%	0.75

Source: Authors' calculation from input-out tables 2000 and 2011 of the respective countries following structure of Sim, Secretario, and Suan (2007)

Table 5A: The Vertical Specialization Coefficients for the Economies Concerned.

Sectors	Bangladesh		Viet Nam		China		Indonesia		India	
	2000	2011	2000	2011	2000	2011	2000	2011	2000	2011
1	0.02	0.06	0.12	0.14	0.03	0.03	0.04	0.04	0.01	0.01
2	0.02	0.07	0.09	0.07	0.04	0.06	0.03	0.04	0.02	0.02
3	0.09	0.14	0.15	0.23	0.02	0.04	0.07	0.06	0.04	0.06
4	0.10	0.08	0.36	0.35	0.10	0.04	0.18	0.33	0.04	0.11
5	0.14	0.04	0.30	0.30	0.09	0.04	0.13	0.17	0.05	0.05
6	0.08	0.06	0.17	0.16	0.06	0.06	0.09	0.08	0.07	0.08
7	0.11	0.20	0.33	0.22	0.07	0.07	0.25	0.16	0.10	0.08
8	0.09	0.34	0.76	0.21	0.25	0.38	0.11	0.08	0.56	0.29
9	0.07	0.15	0.44	0.21	0.09	0.11	0.18	0.16	0.12	0.12
10	0.10	0.14	0.41	0.24	0.09	0.08	0.23	0.24	0.08	0.10
11	0.31	0.07	0.31	0.21	0.04	0.05	0.10	0.08	0.14	0.09
12	0.26	0.14	0.53	0.29	0.07	0.13	0.23	0.13	0.10	0.12
13	0.23	0.24	0.55	0.26	0.07	0.09	0.69	0.57	0.09	0.12
14	0.16	0.50	0.57	0.26	0.17	0.15	0.28	0.29	0.10	0.13
15	0.10	0.75	0.49	0.25	0.06	0.07	0.24	0.12	0.07	0.13
16	0.11	0.98	0.44	0.23	0.06	0.05	0.12	0.12	0.15	0.80
17	0.07	-	0.27	0.13	0.04	0.06	0.13	0.15	0.04	0.10
18	0.11	0.10	0.39	0.23	0.05	0.04	0.20	0.15	0.09	0.10
19	0.01	-	0.39	0.16	-	-	-	-	0.01	0.02
20	0.01	0.01	0.22	0.22	0.03	0.03	0.11	0.05	0.01	0.02
21	0.01	0.04	0.21	0.08	0.03	0.03	0.11	0.05	0.01	0.02
22	0.09	-	0.21	0.15	0.02	0.02	0.06	0.06	0.04	0.08
23	0.04	-	0.35	0.13	0.03	0.03	0.16	0.16	0.05	0.10
24	0.05	0.28	0.61	0.18	0.04	0.04	0.28	0.21	0.03	0.06
25	0.10	0.44	0.47	0.25	0.05	0.08	0.45	0.07	0.06	0.29
26	0.05	0.08	0.14	0.13	0.02	0.04	0.10	0.04	0.03	0.03
27	0.05	0.02	0.17	0.17	0.07	0.04	0.07	0.03	0.04	0.07
28	0.03	0.06	0.15	0.06	0.02	0.02	0.07	0.02	0.01	0.02
29	0.01	-	0.14	0.06	0.01	0.01	0.03	0.12	0.01	0.00
30	0.03	-	0.20	0.12	0.07	0.05	0.20	0.07	0.03	0.06
31	0.03	0.12	0.25	0.11	0.03	0.03	0.13	0.08	-	-
32	0.01	-	0.17	0.09	0.03	0.04	0.13	0.10	0.01	0.03
33	0.04	-	0.25	0.17	0.09	0.07	0.13	0.05	0.05	0.08
34	0.01	0.04	0.15	0.11	0.05	0.04	0.11	0.10	0.05	0.13
35	0.04	-	-	-	-	-	-	-	0.05	0.13

Note. Sector coding is same as Table 2A.

Source: Authors' calculation based on input-output tables 2000 and 2011 of the respective countries

Table 6A: The Domestic Backward Linkage Coefficients of the Industries.

Sector	Bangladesh		Viet Nam		China		Indonesia		India	
	2000	2011	2000	2011	2000	2011	2000	2011	2000	2011
1	1.24	2.01	1.62	1.87	1.80	1.87	1.29	1.31	1.35	1.33
2	1.15	1.77	1.29	1.36	1.91	2.16	1.14	1.19	1.35	1.36
3	1.84	2.33	2.00	2.40	2.37	2.56	1.86	1.89	2.21	2.24
4	2.13	2.14	1.97	2.35	2.44	3.09	1.86	1.60	2.19	2.17
5	1.81	2.30	2.14	2.57	2.63	3.04	1.72	1.76	2.18	2.19
6	2.01	2.15	1.99	3.02	2.48	2.83	1.85	1.78	1.88	1.80
7	1.61	2.03	1.80	2.41	2.33	2.78	1.66	1.83	2.16	2.20
8	1.58	1.32	1.31	2.25	2.13	1.99	1.46	1.40	1.37	1.84
9	1.63	2.27	1.53	2.24	2.41	2.70	1.66	1.74	2.13	2.06
10	1.64	1.77	1.60	2.35	2.53	2.97	1.65	1.73	2.31	2.34
11	1.42	2.27	1.78	2.24	2.42	2.64	1.64	1.66	1.84	1.99
12	1.56	2.25	1.77	2.54	2.67	2.69	1.68	1.78	2.11	2.19
13	1.65	1.48	1.54	2.56	2.54	2.81	1.32	1.51	2.15	2.11
14	1.76	1.55	1.62	2.56	2.47	2.87	1.70	1.66	2.11	2.09
15	1.41	1.43	1.63	2.39	2.70	3.03	1.55	1.85	2.37	2.12
16	1.59	1.44	1.71	2.22	2.29	2.51	1.90	1.82	2.10	1.47
17	1.23	1.64	1.17	1.59	2.05	2.59	1.73	1.83	2.00	2.00
18	1.62	2.09	1.75	2.03	2.62	2.84	1.73	1.78	1.87	1.97
19	1.09	1.86	1.42	1.73	1.00	1.00	1.00	1.00	1.25	1.16
20	1.09	1.44	1.45	1.69	1.95	1.83	1.42	1.58	1.25	1.16
21	1.09	1.38	1.45	1.36	1.95	1.83	1.42	1.58	1.25	1.16
22	1.98	2.38	1.52	1.91	2.22	2.39	1.83	1.66	1.93	1.87
23	1.33	1.58	1.14	1.61	1.87	2.03	1.60	1.76	1.86	1.92
24	1.50	1.87	1.15	1.82	2.24	2.18	1.74	1.77	1.63	1.64
25	1.91	2.02	1.60	2.01	2.23	2.62	1.68	1.62	1.80	1.61
26	1.34	1.65	1.48	1.52	2.19	2.25	1.55	1.29	1.71	1.77
27	1.54	1.61	1.22	1.48	1.87	1.87	1.29	1.49	1.33	1.43
28	1.39	1.64	1.29	1.20	1.71	1.61	1.25	1.32	1.34	1.33
29	1.07	1.42	1.35	1.26	1.52	1.35	1.23	1.56	1.13	1.14
30	1.31	1.92	1.50	1.58	2.16	2.35	1.49	1.60	1.51	1.39
31	1.48	1.70	1.42	1.41	2.03	2.01	1.40	1.61	1.00	1.00
32	1.13	1.58	1.28	1.34	1.88	1.95	1.47	1.71	1.18	1.14
33	1.22	1.74	1.28	1.79	2.16	2.50	1.66	1.68	1.89	1.50
34	1.19	1.56	1.27	1.52	2.09	2.24	1.47	1.64	1.45	1.12
35	1.20	1.53	1.00	1.55	1.00	1.00	1.00	1.00	1.45	1.12

Note. Sector coding is same as Table 2A.

Source: Authors' calculation from input-output tables 2000 and 2011 of the respective countries.

Table 7A: The Import Backward Linkage Coefficients of the Industries.

	Bangladesh		Viet Nam		China		Indonesia		India	
Sector	2000	2011	2000	2011	2000	2011	2000	2011	2000	2011
1	1.02	1.06	1.12	1.14	1.03	1.03	1.04	1.04	1.01	1.01
2	1.02	1.07	1.09	1.07	1.04	1.06	1.03	1.04	1.02	1.02
3	1.09	1.14	1.15	1.23	1.02	1.04	1.07	1.06	1.04	1.06
4	1.10	1.08	1.36	1.35	1.10	1.04	1.18	1.33	1.04	1.11
5	1.14	1.04	1.30	1.30	1.09	1.04	1.13	1.17	1.05	1.05
6	1.08	1.06	1.17	1.16	1.06	1.06	1.09	1.08	1.07	1.08
7	1.11	1.20	1.33	1.22	1.07	1.07	1.25	1.16	1.10	1.08
8	1.09	1.34	1.76	1.21	1.25	1.38	1.11	1.08	1.56	1.29
9	1.07	1.15	1.44	1.21	1.09	1.11	1.18	1.16	1.12	1.12
10	1.10	1.14	1.41	1.24	1.09	1.08	1.23	1.24	1.08	1.10
11	1.31	1.07	1.31	1.21	1.04	1.05	1.10	1.08	1.14	1.09
12	1.26	1.14	1.53	1.29	1.07	1.13	1.23	1.13	1.10	1.12
13	1.23	1.24	1.55	1.26	1.07	1.09	1.69	1.57	1.09	1.12
14	1.16	1.50	1.57	1.26	1.17	1.15	1.28	1.29	1.10	1.13
15	1.10	1.75	1.49	1.25	1.06	1.07	1.24	1.12	1.07	1.13
16	1.11	1.98	1.44	1.23	1.06	1.05	1.12	1.12	1.15	1.80
17	1.07	1.07	1.27	1.13	1.04	1.06	1.13	1.15	1.04	1.10
18	1.11	1.10	1.39	1.23	1.05	1.04	1.20	1.15	1.09	1.10
19	1.01	1.16	1.39	1.16	1.00	1.00	1.00	1.00	1.01	1.02
20	1.01	1.01	1.22	1.22	1.03	1.03	1.11	1.05	1.01	1.02
21	1.01	1.04	1.21	1.08	1.03	1.03	1.11	1.05	1.01	1.02
22	1.09	1.05	1.21	1.15	1.02	1.02	1.06	1.06	1.04	1.08
23	1.04	1.05	1.35	1.13	1.03	1.03	1.16	1.16	1.05	1.10
24	1.05	1.28	1.61	1.18	1.04	1.04	1.28	1.21	1.03	1.06
25	1.10	1.44	1.47	1.25	1.05	1.08	1.45	1.07	1.06	1.29
26	1.05	1.08	1.14	1.13	1.02	1.04	1.10	1.04	1.03	1.03
27	1.05	1.02	1.17	1.17	1.07	1.04	1.07	1.03	1.04	1.07
28	1.03	1.06	1.15	1.06	1.02	1.02	1.07	1.02	1.01	1.02
29	1.01	1.01	1.14	1.06	1.01	1.01	1.03	1.12	1.01	1.00
30	1.03	1.03	1.20	1.12	1.07	1.05	1.20	1.07	1.03	1.06
31	1.03	1.12	1.25	1.11	1.03	1.03	1.13	1.08	1.00	1.00
32	1.01	1.04	1.17	1.09	1.03	1.04	1.13	1.10	1.01	1.03
33	1.04	1.02	1.25	1.17	1.09	1.07	1.13	1.05	1.05	1.08
34	1.01	1.04	1.15	1.11	1.05	1.04	1.11	1.10	1.05	1.13
35	1.04	1.05	1.00	1.09	1.00	1.00	1.00	1.00	1.05	1.13

Note. Sector coding is same as Table 2A.

Source: Authors' calculation from input-output tables 2000 and 2011 of the respective countries.