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An Analysis of the Change and Volatility in the Apparel Industry of Bangladesh after MFA Era

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ABSTRACT

It is an attempt to measure the changes and instabilities in employment and number of apparel factory in Bangladesh after MFA phase out based on secondary data from 1998 to 2011 using different statistical techniques. Though previous studies predicted that the country would experience a significant fall in all of the apparel export, employment and number of factory due to quota facilities elimination, the forecasting proved to be untrue finally. RMG export, employment and number of factory increased significantly. The growth in these three areas improved notably in ATC abolition era. Though instability in garment industry was common in Bangladesh, the sector has been surprisingly more stable during the post MFA Era. This astonishing and overwhelming performance of Bangladesh apparel sector could be attributed to adopting Lean Manufacturing Techniques, formation of Industrial Police Force, political stability, setting up new Captive Power Plants and getting GSP facilities after quota facilities elimination.

Keywords: Lean Manufacturing Techniques, Captive Power Plants, Industrial Police Force GSP, MFA, ATC, JEL Classifications: F13, F14, F16

Introduction

Apparel is one of the labor-intensive sectors that provide an easy access for labor abundant developing countries to global market. Usually an underdeveloped country starts its industrialization with garment manufacturing, what developed countries did earlier for basically one reason; readymade garments (RMG) manufacturing is a labor-intensive, requiring relatively little fixed capital while creating large employment opportunity. Though forty years ago, the industrialized countries dominated worldwide exports in this area, today developing countries produce more than half of the global apparel exports. Apparel industry in Bangladesh has been expanding horizontally and contributing to national development significantly. It comprises of about 16 percent of GDP (FY 2010-11) providing employment (both directly and indirectly) to 10.72 percent of national labor force, in which 6.83 percent are directly employed (BBS& BGMEA). Though it started its venture in the late 1970s, it evolved into as the main exporting industry of Bangladesh by the late 1980s

(Joarder et al 2010). Nearly 79 percent of the total exports of the country comprises of RMG products in FY 2010 – 11(EPB). The country's foreign exchange reserve depends largely on RMG export earnings. During November 2011 to December of the same year, the central bank's foreign exchange reserve fell to an average of US$ 9460.05 million (lower than the amount of US$ 10000 million required to pay at least three months' import expenditure) mainly because of a slowdown in apparel export (BB).

The rise of the apparel industry in Bangladesh to today's state was mainly due to the MFA (Multi Fiber Arrangements) quotas, which came into force during the period between 1974 and 2004. The key objectives of the agreement were to bargain and to prioritize textile and clothing products from the under developed countries by giving their products a favored position in the markets of the developed countries. Unfortunately following the decisions in the Uruguay Round negotiations in the 1990s, it was declared that the MFA would be phased out by December31, 2004. The declaration resulted in a wide variety of effects among the apparel exporting countries exactly like "what is sport to one is death to another". It panicked the countries who were beneficiaries from the quota system. However it calmed down some countries that were eyeing a prosperous global apparel market. Researchers and apparel experts have conducted many research studies, but most of the studies were more or less identical in anticipating the adverse effect of MFA phase out in developing countries. The anticipated result was that poor preference-receiving countries would suffer tremendous job losses, plant closures and finally export revenue losses during post ATC (Agreement on Textiles and Clothing).

ILO (2005) mentioned that during the MFA period, employment in textiles declined worldwide – from 19.7 million workers in 1990 to 16.8 million in 1995 and 13.5 million in 2000. Accordingly it was projected that the phase out of MFA would make employment falling faster along with production plant closures. Though China, Pakistan, India and Bangladesh are the most important employers in textiles among developing countries, Bangladesh is to suffer job losses after MFA era only. These countries except Bangladesh have been losers of in the MFA era and are consequently beneficiaries from quota phase-out. Collecting data from ILO (2005) and Nordas (2004), Whalley, John (2006) showed that employment in clothing sector of the US and the EU had been steadily falling from 285.9 thousand and 417.8 thousand to 269.3 thousand and 409.6 thousand by the end of the second half of 2004 respectively. These reductions continued at a faster rate after the MFA removal. By the end of the first half of 2005, employment in the sector of both the regions had fallen by 4.94 percent and 2.01 percent respectively. Fair Labor Association (2007) argued that in the past eighteen months, the Dominican Republic has lost an estimated 50,000 jobs in the apparel sector only. Declining employment and numerous plant closures reflect the weakening position of Dominican exporters in the U.S. market. Between 2004 and 2006, apparel exports from the Dominican Republic to the United States fell by nearly 25 percent. Although the current value of the national currency against the U.S. dollar exacerbates the competitive pressure on Dominican exporters, the underlying cause of this decline is the restructuring of the global apparel industry following the phase-out of the MFA.

Using a global general equilibrium modeling system and database (known as the GTAP model), Mlachila and Yang (2004) showed that Bangladesh's export of RMG could fall by 20 percent resulting in a contraction of employment by 5-13 percent. Almost identical results are also reported by Ahmed, F. E. (2004), according to which the elimination of MFA quotas would lead to a decrease of the Bangladeshi wearing apparel export production by 20 percent. Moreover Khondker et al (2005) opined that Post-

MFA export trends are likely to influence employment and working conditions in the RMG sector. Falling export orders, causing closure of factories and consequent loss in employment and increased competition exerting downward pressures on prices are two possible channels through which employment situation and working conditions in the RMG industry can get affected. The possibility of net employment loss along with a growth in the overall RMG export revenues cannot be ruled out. This is possible if the labor intensity across RMG products differ.

On the other hand, Nordas's (2004) simulation exercises show Bangladesh's share in the EU clothing imports to rise by one percentage point (from the current share of 3 percent to 4 percent), but the US market share declines (from the existing 4 percent to about 2 percent). Moreover Khondker et al (2005) report on a UNDP survey covering 35 firms producing ready-made garments in Bangladesh. None of the firms report a reduction in employment after MFA abolition, and 19 of the 35 firms hired more workers after quota the period. They claim no reports of factory closures in Bangladesh following MFA removal. These results are completely opposite to the predictions made earlier. Though its more than seven years since the quota system elimination has been passed, no study has been carried out yet on the issue. Hence the impact of MFA removal on employment and number of factory are ambiguous until now. In order to assess the impact, this paper is intended to;

1) measure the change and instability in apparel export, employment and number of factory.
2) determine the growth rate of apparel export, employment and number of factory.
3) derive policy suggestions in the light of the above objectives.

Methodology

In order to examine the nature of change, volatility and the degree of relationship in apparel export, employment and number of factory of Bangladesh, various statistical measures, such as mean, correlation coefficient, regression analysis and coefficient of variation were used. These statistics were suggested by Hasan et al 2008 as a better measure of change and instability.

For change measurement– Since MFA had been phase out by January 1st2005; leading real variables of the sector have changed much. In order to identify the significant change in apparel export, employment and number of factory between the two periods, the following formula was used:

$$t = \frac{x_1 - x_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}}$$

x_1 = Mean of the data of MFA Era, x_2 = Mean of the data of Post MFA Era.
s_1^2 =Variance of the data of MFA Era, s_2^2 =Variance of the data of Post MFA Era.
df= Degrees of freedom

For regression analysis–The apparel export is likely to be influenced by the employment as well as number of factory used for RMG production. In order to measure the influence of both employment and number of factory on apparel export, the following linear regression model was used:

$$y = a + b_1 x_1 + b_2 x_2 - u_i$$

Where, *Y*= Apparel export, X_1= Employment in apparel factories and X_2= Number of apparel factory.

For growth rate measurement–Since the percentage measure in changes is significant, the growth rates of apparel export, employment and number of factory were worked out by fitting a semi-log function of the following type:

$$y = e^{a+bt} or \ \ lny = a + bt$$

Where, *Y*=Apparel export or Employment in apparel factories or Number of apparel factory, and

t = Time period (year)

For instability measurement - An index of instability was computed for examining the nature and degree of variability in apparel export, employment and number of factory in Bangladesh. The co-efficient of variation (CV) was worked out for apparel export, employment and number of factory to measure of variability. However, simple CV does not explain properly the trend components inherent in the time series data. Alternatively, the Coefficient of variation around the trend (CV_t) rather than co-efficient of variation around the mean (CV) was suggested by Cuddy and Della (1978) as a better measure of variability. A linear trend $y=a+bt+e$ was fitted to the indices of apparel export, employment and number of factory for the period 1998 - 2011 and trend co-efficient "b" was tested for significance. Whenever the trend co-efficient was found significant, the index of instability was constructed as follows:

$$y = a + bt + e$$

Where; *Y* = Apparel export or Employment or Factory, and t = Time period (year)

$$CV_{t=}\ CV\ \times\ \overline{1 - R^2} Where, CV = \frac{Standard\ deviation}{Mean} \times 100$$

In words, co-efficient of variation (CV) around the mean was multiplied by the square root of the proportion of the variation, which was unexplained by the trend equation, $y=a + bt+e$.

Data description

The study is largely based on information from secondary sources. Time Series data on apparel export, employment in apparel factories and number of apparel factory for fourteen years from 1998 to 2011 were collected from different sources. Data on employment and number of factory were collected from BGMEA (Bangladesh Garment Manufacturers and Exporters Association) database, whereas apparel export data were from ITC (International Trade Center) Trade Map (*Appendix Table*). The entire period was divided equally into two periods containing seven years each (i.e., MFA Era from 1998 to 2004 and Post MFA Era from 2005 to 2011) to compare in apparel export, employment and number of factory between the two periods.

Results and Discussion

Change in apparel export, employment & factory over the periods

Most of the previous research studies projected that Bangladesh would experience a negative change in all areas of apparel export, employment and factory due to quotas phased out. To deal with the post-MFA situations, employers' organizations, e.g. BKMEA, BGMEA, etc. have been undertaking serious efforts in obtaining duty-free access to the US market, which could increase Bangladesh annual exports by US$ 0.5 billion, providing additional employment to about 180,000 people (Khondker et al 2005). After the MFA era, all of the three above mentioned factors have changed significantly but positively (see table 1 below). And here all the predictions proved to be wrong. During the

MFA period, the average export value from Bangladesh was about US$ 4542293571or US$ 4.54 billion employing 1.43 million labors as well as 2812.57 factories.

Table 1. Change in apparel export, employment & factory

Field of Measurement	Mean Value MFA Era (1998-2004)	Post MFA Era(2005-2011)	t-value	P(T<=t) two tail
Apparel export	4542293571	12559466000***	-4.560	0.005
Employment	1430000	3122857.14***	-5.582	0.000
Factory	2812.57	4802.43***	-5.611	0.000

Note: '***' and '*' represent significant at 1% and 10% level

In the post MFA era, export value has gone up by 176.5 percent. Likewise employment and number of factory have increased by 118.38 percent and 70.75 percent respectively. The average apparel export reached to about US$ 12559466000 or US$ 12.56 billion along with 3.12 million workers being employed in4802.43 factories. The change between these two period's export values is highly significant at 1% level. Similarly the mean differences between the employment levels as well as the number of factory in two periods were highly significant.

Correlation test

A frequently used technique for measuring the changing attitude of input (e.g. employment and number of factory) and output (e.g. apparel export) is correlation. Since the possibility of employment reduction along with a growth in RMG export value cannot be ruled out, this method built on the rational that if employment (and number of factory) influences apparel export, the numerical evidence on this relationship is the value of correlation coefficient (r) given in table 2.

Table 2. Relationship between Apparel Export & Employment and that between Apparel Export and Factory

Field of Measurement	Measurement period	Value of Correlation (r)	P(T<=t) two tail
Apparel export Vs. Employment	Whole period	0.933***	0.000
	MFA Era	0.805**	0.029
	Post MFA Era	0.935***	0.002
Apparel export Vs. Factory	Whole period	0.823***	0.000
	MFA Era	0.802**	0.030
	Post MFA Era	0.911***	0.004

Note: '***' and '*' represent significant at 1% and 10% level

The correlation coefficient of employment (or number of factory) and apparel export for whole period is 0.933 (or 0.823), which is highly significant at 1% level implying that the increment of employment (or number of factory) strongly affect the apparel export. Since the value of r of RMG export vs. employment is higher than that of RMG export vs. number of factory, the employment has a greater influence on apparel export. In the post MFA era, the relationship coefficient has been measured as 0.935 for export vs. employment (and 0.911 for export vs. number of factory) whereas it was as 0.805 (and 0.802) in quota system period. Therefore the relationship between employment (or number of factory)

and apparel export became stronger in post MFA era.

Regression analysis

The simple linear regression functions were fitted for estimating the response of apparel export due to the change in employment and number of factory. During the MFA period, RMG export was increased by about US$ 1501.82 for a unit change in employment, whereas it was decreased by about US$ 97550.83 for a unit change in number of factory. After the quotas system, garment export has increased by US$ 6710.65 and US$ 355629.78 for a unit change in employment as well as number of factory respectively.

Table 3. Testing dependency of apparel export on employment & factory

Field of Measurement	Measurement period	Regression Coefficient	t-value	P(T<=t) two tail
Constant	Whole period	3015407999*	1.801	0.099
	MFA Era	2669063146	1.786	0.148
	Post MFA Era	-10104823007	-0.309	0.772
Employment	Whole period	9450.75***	7.098	0.000
	MFA Era	1501.82	0.243	0.819
	Post MFA Era	6710.65	1.194	0.298
Factory	Whole period	-4196582.07***	-3.699	0.003
	MFA Era	-97550.83	-0.027	0.979
	Post MFA Era	355629.78	0.034	0.974

Note: '***' and '*' represent significant at 1% and 10% level

Therefore the marginal impact of employment on apparel export has risen by about 346.83% with compared to marginal impact during MFA period. Likewise marginal impact of number of factory has increased by about 464.56%.It is interesting that in post MFA era, both of the labor productivity and factory performance raised notably. In order to explain the interesting findings, numbers of factors have been identified where production technique has been considered as most important. During the MFA era, Traditional Manufacturing System was followed at apparel factories in Bangladesh. It was a simple method, where production decision was made based on entrepreneur's experience or learning by doing process. During the period, most of the factories were small or medium in economies of scale. After the period global competition rises and mainly three factors i.e. reduced cost, short lead time and improved quality determine the success in global market. Considering these factors and to ensure sustainability in global market, maintain previous profit margin, repeat business & achieve larger economies of scale, apparel entrepreneurs had felt the necessity of adapting advanced technologies as well as techniques. Finally they introduced "Lean Manufacturing System". It is implemented through five phases namely; Phase 1- Lean Assessment, Phase 2- Awareness Development Training Program, Phase 3- Setting up 1st Pilot Run, Phase 4- Support Concept and Phase 5- Global Changes. The implementation of the new system caused a tremendous success in apparel sectors. To measure the success Productivity Improvement Cell (PIC), a wing of iART (Institute of Apparel Research & Technology), BKMEA has undertaken a survey at factory level where the new system has been followed. PIC fixes some

Key Performance Indicators (KPI), e.g. Line Balancing (LB), Work in Process Inventory (WIP), Labor Productivity (LP), Alter, Reject and Spot to evaluate the outcome of new system. The findings of the survey provided excellent outcome that is, LB and LP raised by about 11% and 24.5% respectively. Along with LB and LP WIP, Alter, Reject and Spot reduced by about 85.4%, 10.67%, 33.34% and 75% respectively.

Growth rate of apparel export, employment and factory

The growth rate of apparel export, employment and number of factory provides a good measure for previous changes as well as an acceptable indication of changes in future. Though researchers anticipated that Bangladesh would experience a negative growth rate in all these three areas after MFA period, the obvious results is in table 4. The growth rate of all variables has risen positively and significantly during any period under consideration.

Table 4. Growth rate of apparel export, employment and factory

Field of Measurement	Measurement period	Growth Rate (%)	P(T<=t) two tail
Apparel export	Whole period	13.42***	0.000
	MFA Era	6.68**	0.016
	Post MFA Era	17.53***	0.000
Employment	Whole period	12.12***	0.000
	MFA Era	17.43***	0.000
	Post MFA Era	9.08***	0.002
Factory	Whole period	8.47***	0.000
	MFA Era	15.08***	0.000
	Post MFA Era	3.13***	0.002

Note: '***' and '*' represent significant at 1% and 10% level

During the ATC era, export growth rate was 6.68%, whereas it was about 17.53% after that period. It should be mentioned that for the initial 5 years of the post MFA era, it was about 17% (Joarder et al 2010).Though the growth rate of employment and number of factory were about 17.43 percent and 15.08 percent in the first half respectively, these changed positively with lower magnitudes in the later half. That is, during the post MFA era, magnitudes of these three variables have increased but at a decreasing rate. This unanticipated growth of Bangladesh's apparel sector could be result of newly adopted "Lean Manufacturing System", resulting in lowest wage rate, competitive export price and getting the GSP facilities.

Instability in apparel export, employment & factory

Instability in apparel sector of Bangladesh is common. The sector is affected by both external and internal forces. Abolition of MFA and imposition of other tariffs and non-tariff barriers, etc. were identified as the external forces, whereas domestic political instability, labor strike and riots, and insufficient energy supply to the sector affect RMG production internally and largely. Since fluctuation in apparel export, employment and number of factory are interrelated, if the impacts of these shocks remain favorable to productivity, higher employment and greater factories will result in larger RMG export. The instability in clothing export, employment and number of

factory are shown in table 5. During the MFA period, employment and number of factory experienced the highest degree of instability, which is significant at 1% level, whereas apparel export realized lower degree of volatility. In the period the country enjoyed an international "managed trade" regime in the apparel. However, the country experienced much domestic instabilities such as – political strikes and demonstrations, labor riots and destructions, etc. There had been a wave of violent class struggle in the garment industry. Factories were burnt down by picketers and hundreds more looted. Inadequate supplies of energy and water resources to factory exacerbate the adverse internal force as well as made production more unstable.

Table 5. Instability in apparel export, employment & factory

Field of Measurement	Measurement statistics	Whole period	MFA Era	Post MFA Era
Apparel export	CV	61.097%	18.584%	36.426%
	R-square	0.864	0.685	0.976
	P(T<=t) two-tail	0.000***	0.022**	0.000***
	D-W	0.386	1.273	2.831
	CV around trend line	22.531	10.430	5.643
Employment	CV	45.412%	35.593%	19.864%
	R-square	0.976	0.992	0.872
	P(T<=t) two-tail	0.000***	0.000***	0.002***
	D-W	1.169	1.852	1.186
	CV around trend line	7.035	3.183	7.107
Factory	CV	31.869%	31.118%	7.043%
	R-square	0.944	0.983	0.884
	P(T<=t) two-tail	0.000***	0.000***	0.002***
	D-W	0.377	2.148	0.797
	CV around trend line	7.541	4.057	2.398

Note: '***' and '*' represent significant at 1% and 10% level

After the MFA phase out, global apparel market has been more competitive. To ensure sustainability in the market, subsequent profit margin and repeat business, internal shocks should be neutralized or minimized. Realizing the fact, both of political parties (ruling & opposite party) and garments owners are now aware much. In the recent days, the trend of political strikes has been fallen notably. Garment owners revised basic wages for labor and provide other facilities to them. The government has formed "Industrial Police Force" to maintain security and stability in the industrial zones. The force formally started its journey on 31 October 2010 and has been trying to maintain peace in the main four industrial zones- Ashulia, Gazipur, Narayangonj and Chittagong. In addition to, government has setup new captive power plants and encourages private entrepreneur to invest more in power sector

to reduce frequent power cut problem. These initiatives resulted in a reduced instability in employment and number of factory. However abolition of quotas system made apparel export more unstable. In the study, it is found that employment and number of factory were significantly more stable at 1% level, whereas apparel export was more volatile. According to the D-W test statistics, employment has been found as un-auto correlated with its lagged values during any period under consideration. Though apparel export and number of factory have been found as un-auto corrected with their respective lagged values during both of the MFA as well as post MFA period, these

have been found as different in the whole period time frame.

Concluding Remarks

The MFA termination led to a dramatic change in apparel sector of Bangladesh. However the change was largely counter-intuitive. RMG export, employment and number of factory rose instead of falling. These increased by more than twice except number of factory. These successes have come due to a number of initiatives undertaken by both public and private sectors. During the quota free period, entrepreneurs adopted new production technique named "Lean Manufacturing System", which has increased labor productivity as well as firm performance. Adaptation of the technology has improved efficiency, ensured both better line balancing and better floor space organization as well as reduced quality alteration, spot & rejection. As a result, marginal impact of both employment and number of factory on apparel export has risen significantly and also found clearly in the research findings. In order to get further higher output, apparel experts and researchers should concentrate on exploring further advanced technology or at least up-gradation of Lean Manufacturing System.

The GSP facilities (i.e. exemption from the more general rules of the World Trade Organization) provided for least developed countries enhanced the export growth of Bangladesh apparel greatly. Under the GSP facilities, the country has been experiencing duty free or tariff relaxed access for garment items into European Union (EU-27), European Free Trade Association (EFTA), Canada, Australia, Malaysia, and so on. The tariff relaxation for Bangladesh enables the country to enjoy exponential export growth overtime and emerge as the second largest apparel exporter of the world. In spite of being a least developed country, Bangladesh is to face potential trade barrier in some locations, e.g. USA etc. In the USA, all Bangladeshi goods except textile & apparel are exempted from high tariff, but Bangladesh cannot be capitalized from the opportunity because of its trade structure. About 80% of total exports of the country are apparel items and the country cannot realize potential price competitiveness of garment products in USA market. So Bangladesh should negotiate with USA to include textile & apparel under GSP scheme. In order to protect the garments export from various external obstacles and enjoy the facilities to other traditional markets, government and trade associations should take initiatives together.

Moreover Political instability and labor strike in factory were common phenomena in the country. These uncertainties have been reduced recently by forming "Industrial Police Force" as well as other necessary legislative rapid actions. The research findings of the paper (CV) validate these efforts as effective to reduce instability of the sector. For further stability in the area, factory owners as well as government should consider a higher wage structure enabling to meet at least basic needs of workers. However the wage structure has been revised and increased recently, but the increment is not enough. Energy crisis was a well-known bottleneck of industrialization in the country. The spread between demand and supply of electricity was high. The gap has reduced recently by setting up new power plants. In addition to, currently private entrepreneurs are investing in power sector more. These initiatives have stabilized garment industry notably. The study found also a remarkable stability in the sector after quota system elimination. Therefore the apparel sector of Bangladesh showed a dramatic rising performance both externally and internally during post MFA era.

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Appendix Table

Year	Number of Factories	Employment	Total RMG Value in US$
1998	1697	780000	3821290000
1999	1821	910000	3965280000
2000	2377	1130000	4385410000
2001	2982	1470000	4295118000
2002	3252	1700000	4056874000
2003	3571	1900000	5040792000
2004	3988	2120000	6231291000
2005	4220	2250000	6845534000
2006	4490	2400000	8252021000
2007	4743	2810000	9323248000
2008	4925	3500000	13524847000
2009	5063	3600000	14197010000
2010	5085	3630000	16559132000
2011	5091	3670000	19214470000
Data Source	BGMEA Database	BGMEA Database	ITC Trade Map