

# A Study on the Export Potential of Bangladesh's Ready-Made Garments

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## 〈Abstract〉

This article explores the international trade flow of Bangladesh's ready-made garments (RMG). We first suggest the brief history and an international structure of trade among countries by using the trade volume. Then we implemented a gravity model regression with the sample of 38 major partner countries in order to investigate the potential export market for the RMG industry. The fixed effect and random effect model for the panel data during the period of 1990 to 2011 are estimated. Our result shows that Bangladesh's RMG exports are affected positively by the size of economy, inflation, exchange rate, foreign direct investment(FDI) and trade openness. On the other hand, the distance between trading partners are related negatively with the trade volume. We used the estimated coefficients from the panel regression in order to predict RMG export potential of Bangladesh. This might show which country is the promising export market for Bangladesh RMG industry. We found that Bangladesh has the highest potential of RMG export with Japan and USA, which seem to have considerable room for export growth if trade barriers and constraints are removed. We added some policy implications for encouraging the RMG export of Bangladesh by using the results from the analysis.

Key Words: Bangladesh, Ready Made Garments, Gravity Model, Export Potential

## I. Introduction

According to the traditional trade argument, international trade plays a supportive role in the process of economic growth for the least developing countries(LDC). It can boost a country's development and create a gain of the economy. In particular, the export can be a transforming vehicle to economic and political development. Trade policy can encourage the domestic production by importing advanced technology and foster growth of export. Consequently, it plays a crucial role to fill the foreign exchange gap by increasing export capacity and reducing dependence on foreign aid. For that reason, international trade has been touted as an important tool in the path to economic growth and development by prominent economists. If we look at the background of the historical development of the world, it is straight forward that international trade had played a significant role in that development. Many developed countries, once upon a time, were developing countries and international trade has largely contributed for their development(Salvatore, 1990). In the second half of the 20th century, the rise of the Asian tigers(South Korea, Hong Kong, Taiwan and Singapore) have got a special attention in the external sector, where export promotion and strong political commitment have been given greater emphasis than other sectors (Fischer, 2002).

In 1971, Bangladesh had moderate foreign policy that placed heavy confidence on multinational diplomacy. From the time, the

export sector of Bangladesh has been with few primary commodities: garments, frozen fish, seafood, jute, jute goods, and leather. Among these, the export performance of ready-made garments(RMG) has reached a remarkable level in recent years. Therefore, RMG sector seems to have increased foreign exchange earnings, employment, and have reduced poverty. RMG of Bangladesh has grown up very sharply and contributed a lot to the high GDP growth rate of Bangladesh in recent two decades. The country has become the second largest garments exporter in the world. In 2014, Bangladesh's RMG export was around US\$24.5 billion, which accounted for around 80 percent of the total export earning of the country. We, however, need to note that from the beginning of the independence, the country has been sustaining trade deficit because of larger import. Moreover, a comparison of share in world trade performance between Bangladesh and other Asian countries shows that Bangladesh's world trade share is still very low and the trade structure does not look very impressive. It seems true that Bangladesh imports the high value added materials and intermediate goods from other countries and adds small values to them and export the final garments.

In this paper, we investigate the international trade structure among the related countries in RMG industries to see what is going on in this area. After showing the brief story, we use the gravity model to estimate the export potential of readymade garments of Bangladesh. This model is enormously popular as the

empirical tool in international trade. We consider the bilateral export flow of Bangladesh's readymade garments by using the model and panel data of 38 partner countries for the period of 1990 to 2011. The study tries to find out the most potential countries for Bangladesh's RMG export and how much space is left to export of Bangladesh's garments in those countries. The finding of this study will help the policy maker, researchers, government and the partner countries set up the specific policies. Indeed, it can provide as a lesson about trade barriers and the RMG export capacity of Bangladesh.

## II. Survey of literature

### 1. RMG industry of Bangladesh

Even though RMG industry is very important for Bangladesh, it seems that there has not been much empirical analysis research enough to see the real sides of Bangladesh RMG. Rhee(1990) identifies the major elements and pioneering efforts of foreign aid that have contributed to the remarkable success of Bangladesh's garments export. Yunus(2012) has discussed the source of competitiveness of

the garments industry in Bangladesh, which was represented by low- wage of labor. Joarder et.al(2010) analyzed the post-MFA export performance of major apparel exporting countries, especially concentrating on Bangladesh RMG industry. The study found that Mexico lost its market share in the U.S market in spite of preferential access and geographical proximity. Turkey also lost its market share in EU market in similar condition. In addition, China and Vietnam lost their market share because of the global recession. However, Bangladesh not only held its previous gain but also improved performance considerably during both post-MFA and recession period with the support of low wage rate.

On the other hand, it seems true that RMG industry in Bangladesh does not pay a considerable attention to R&D, technological efficiency, labor right, working environment, the cost of production, and so on. The important thing is that most of foreign buyers may switch their order from Bangladesh to other countries, if the conditions are not improved. The major apparel brands may choose to exit the Bangladeshi market any time(Ahmed, 2014).<sup>1)</sup> Ahmed & Nathan(2014) discussed the local situation related to workers and organization, which recently resulted in increases in wages and improvements in

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1) But we still have other research which reports that the high profitability of garment manufacturing was thanks to other factors than the low wage rate (Motaleb and Sonobe, 2011). This paper finds the following factors for the RMG industry of Bangladesh. First, initial infusion of specific human capital attracted a number of highly educated entrepreneurs to the industry. Second, the division of labor between manufacturers and traders have facilitated the expansion of the industry. Third, enterprise growth has lasted long because of the continuous learning from abroad by the highly educated entrepreneurs.

working conditions in Bangladesh. It deals with the impact of a high geographic concentration of workers, which is related with the increase of the voice of workers and makes the government and industry improve wages and working conditions. These improvements, of course, seem to be the result of changes in horizontal relations within the garment global production network.

## 2. Gravity model

Since we use gravity equation for the regression analysis, we suggest some research which used similar methodology with this paper. Frankel(1993) has used the gravity model to examine bilateral trade pattern throughout the world and analyzed trade block and exchange rate stability in Europe. Frankel (1995) estimated transportation cost from statistics using gravity model throughout the world to analyze the impact of trading bloc and estimates suggest that trading bloc by the order of the EC is in fact supernatural.

Rahman(2003) considers Bangladesh's bilateral trade using panel data estimation technique and generalized gravity model with 35 partner countries for the period of 1972 to 1999. The study reveals that economy size, per capita GNP and openness affect the Bangladesh's export positively.

Batra(2006) used an augmented gravity model to estimate global trade potential for India using the OLS technique with cross-section data approach for the year 2000. The study found that Pakistan had the highest

potential. But China could also be a tremendous potential market. Trade between China and India can be more than double by removing trade barriers.

Thai Tri Do(2006) examines Vietnam's trade activities and trade potential between Vietnam and 23 European countries with the help of gravity model and panel data estimation technique for the period of 1993 to 2004. This study identifies significant factors and utilize trade potential for the improvement of Vietnamese trade.

Kimura and Lee(2004) analyzed the various factors on bilateral service and goods trade using the gravity model from 10 OECD member countries to other economies(including OECD and non-OECD member countries) for the period of 1999 to 2000. The result shows that there is some difference between service trade and goods trade, with regard to the elasticity of explanatory variables. The study also indicates that the cost of transportation for services is higher than that for the goods. The author found that membership in the same region has a significant impact, even though both goods and service trade are positively affected by economic freedom, but the effect from the service trade is stronger than that of goods. The study suggests that countries move toward liberalization. If service trade grows faster, then it will play important role in the global economy. Antonucci and Manzocchi(2006) examines Turkey's trade flow between Turkey and European countries(EU) using gravity model for the period of 1967 to 2001. This study considers whether merchandise

exchange between two parties exceeds what the gravity approach predict.

Kaur(2010) examines India's export potential between India and SAARC countries. The study finds that India is a source of potential investment and technology and a major market for the product from all other SAARC members. In addition, we can find hundreds of papers which use similar equations for the regression analysis.

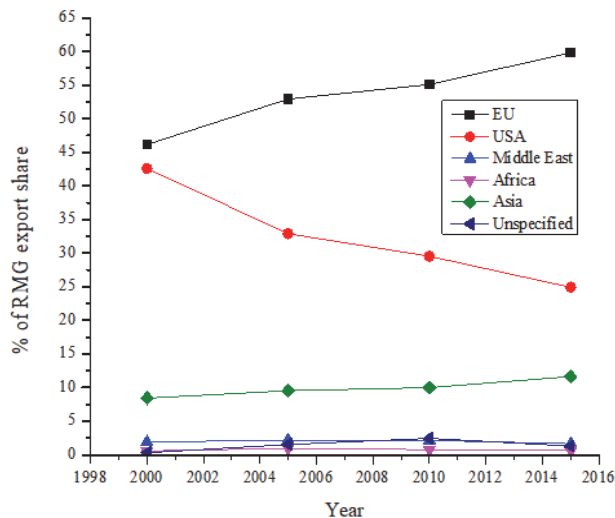
This paper differs from the previous studies about Bangladesh's international trade in the following sense. Most of the studies have used the gravity model on trade issue to quantify the gain from trade but only very few studies of them concentrate on readymade garments (RMG) export and its potentiality to all over the world. The study reveals how RMG export is affected by different factors and which

countries will be the most potential countries for RMG industry of Bangladesh.

### III. Overseas trade overview of Bangladesh

#### 1. Bangladesh's export performance

In 1970s, Bangladesh was a relatively closed economy and its export depended only on agricultural product produced by smallholders (agricultural commodities such as jute, tea, tobacco). But Bangladesh's RMG export become the biggest item since the 1980s and more than 80% of exports are from this item nowadays. The major exporting markets of RMG are in Europe followed by America and Asia.



Source: World Integrated Trade Solution (WITS)

<Figure 1> Bangladesh's RMG export share to different part of the world (%)

The highest percentage of RMG export of Bangladesh is generated from European nations, where the market share was above 50% each year. The USA has taken a second largest portion of Bangladesh's export but it has been decreasing. Bangladesh has made a

strong trade relation and effective trade agreement with Asian countries to expand their trade area, which exhibited the extensive increment from around 10.31% in 2008 to about 13.01% in 2015(Figure 1).

<Table 1> Bangladesh RMG export to different part of the world (Mil. \$)

Partner	2000	2005	2010	2015
Asia	463	263	978	1,151
Europe	2,535	4,413	9,749	15,902
America	2,338	2,797	5,429	6,632
Mid East	106	101	277	270
Africa	32	29	111	66
Unspecified	17	75	193	152

## 2. RMG export and import

The journey of the garments industry of Bangladesh has started in the late 1970s, which was possible by the investment of South Korea and Hong Kong to take the opportunity by using Bangladesh's export quotas in the restricted market as well as an abundant cheap labor. By the late 1980s, apparel evolved as the main export industry of Bangladesh. It became the main source of foreign exchange earnings and contributed a lot to the GDP within a short period. Over the last two decades, export of Bangladesh has been shifted from resource-based to process-based and from a significant dependence on primary commodities to manufacture commodities. In the 1990s Bangladesh's export has been grown up consequently by the RMG

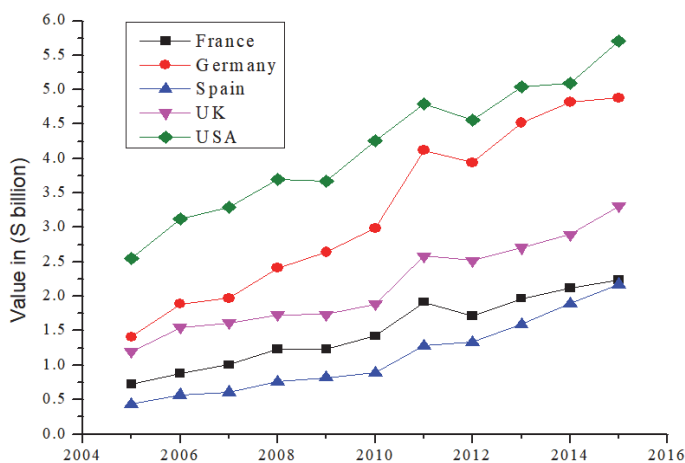
centric export structure and this industry's exports reached \$19 billion in 2011-2012.

Figure 2 shows that the highest percent of RMG export of Bangladesh goes to five giant countries (USA, Germany, French, Spain and UK), which might imply that the country has highly concentrated only on a few nations. USA has taken the first largest portion as a dominant importer of Bangladesh's RMG, and the UK has exhibited an oscillatory trend as a second largest importer, which has been increasing from the beginning. As a whole, Bangladesh's RMG trade shows an increasing trend within a very short time.

Figure 3 shows that Bangladesh mainly imports RMG from five Asian countries; China, India, Singapore, Korea, and Malaysia. In particular, high concentration is put on two countries; India & China. As a consequence,

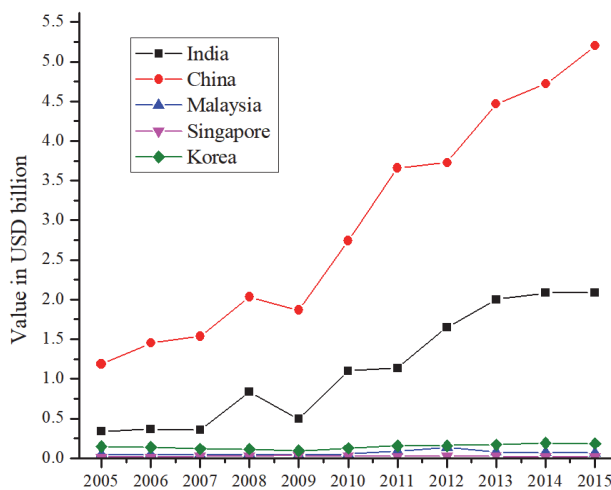
China has taken the largest portion as a dominant exporter to Bangladesh. From 2009 to 2015 it had the consistent position over the years. India exhibited an oscillatory trend as a second largest exporter to Bangladesh. From 2009 to 2015 it has been increasing consistently. As shown in figure 4, from 2009 Bangladesh's RMG has an extremely increasing trend

compared to the previous year performance. This surprising growth of RMG sector has been possible because of the continuous support of the government, foreign investor, exports quotas in the restricted market, lowest wage rate, and generalized system of preferences(GSP) status for Bangladesh.

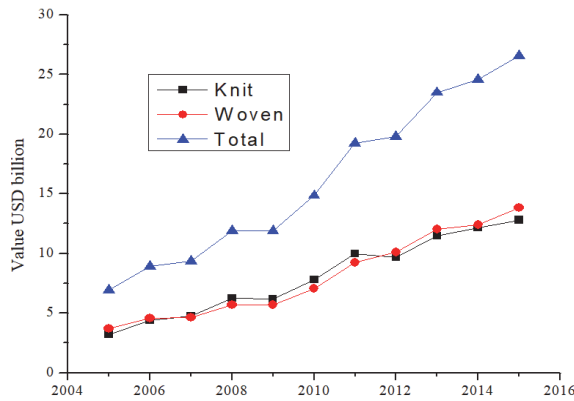


Source: World Integrated Trade Solution (WITS).

<Figure 2> RMG exports to top 5 partners



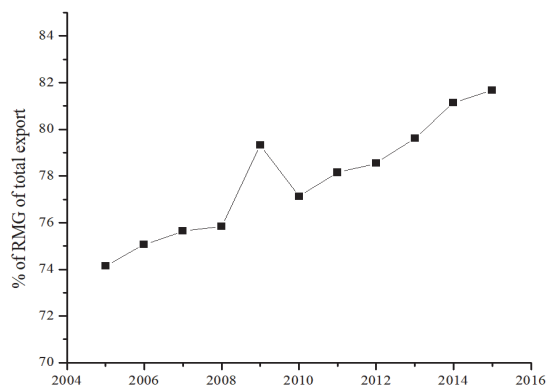
<Figure 3> RMG imports from top 5 partners



<Fig 4> RMG Export of Bangladesh by items

Therefore, there was a drastic increment in the export revenue of RMG prompted by the volume of production. From 2012 through 2013 two deadly incidents happened in Bangladesh's garment industry (Tazrin Fashion fire and Rana Plaza collapse). This incident brought worldwide attention to the worker safety and labor standards violations of Bangladesh. After that, big global clothing brands put pressure for Bangladesh to make the industry international standards. Therefore, Bangladesh's RMG export trend has been decreased from 2012 to 2013. As the figure 3 shows there is a

close correspondent relation between woven and knit garments from 1994 to 2004 and an increasing trend together from 2005 to 2015. Bangladesh is the world's second biggest exporter of garments after China. As the figure 4 shows readymade garments (RMG) covered 80% of total export of the country during the period of 2013-2014. RMG export of Bangladesh had grown very fast and it held a big portion of the total export of Bangladesh from the year 1986 and increased so fast until the 1990s. The share seems to have increased steadily in the recent years.



<Figure 5> RMG export / total export

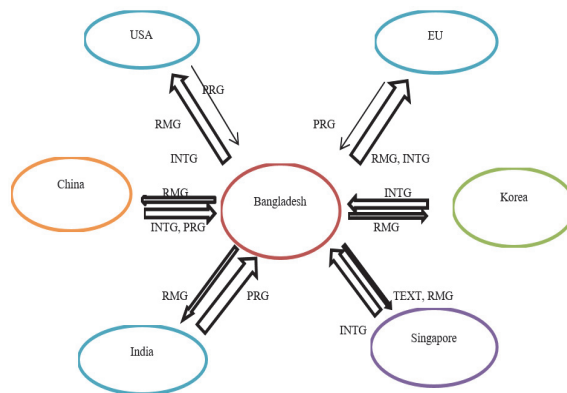


### 3. International Trade structure of Bangladesh's RMG

Bangladesh's RMG industry has grown rapidly over the last three decades and it has also attracted a remarkable attention from the international community. But it has been much dependent on US and EU market. Bangladesh's trade flow of RMG happens mainly with India, China, Korea, US, EU, and Singapore.

Figure 6 shows that Bangladesh's garment industry is integrated into the global distribution and processing trade. This processing trade related with primary goods

(PRG), intermediate goods (INTG) and readymade garments (RMG). Bangladesh is the largest importer of garments accessories and raw materials such as fabrics, wool, bottoms, and zippers. In particular, it imports those goods from India, China, Korea, Singapore, USA and EU. On the other hand, Bangladesh has become a second largest garment exporting country in the world. Especially it exports to USA, and EU markets. This is reflected clearly in Bangladesh's bilateral trade imbalance. With India, China, and Korea, Bangladesh has a massive trade deficit while it has trade surplus with USA and EU.



Note: Primary goods (PRG), Readymade garments (RMG), Intermediate goods (INTG), Textile (TEXT).

<Figure 6> Bangladesh's RMG trade structure

Despite its privileged status as a least developing country and consecutive economic growth due to the expansion of export in the earlier time, Bangladeshi trade composition implies major constraint, issues, and challenges that hinder the country from further development. These obstacles seem to collectively

deteriorate Bangladesh's trade condition. Lack of export diversification and huge reliance on RMG industry forced the country to be in a restricted economic position and struggle in the growing competition with its neighbor countries. Lack of raw materials forced the country to heavily rely on the imports, and to

deteriorate its terms of trade and exchange rate. This dependence on the import brings about an increase in cotton demand, making commodity price fluctuate over the long term. Some studies argue that Bangladesh should promote trade openness by lowering import tariff protection (World Bank 2007). However, such liberalization could further accelerate its raw material import, harming Bangladeshi local industry. Nevertheless, an adequate trade policy that enhances productivity and promotes export diversification should be implemented in order to reduce the abovementioned challenges.

#### IV. Methodology

##### 1. Regression model

The model had applied Newton’s universal law of gravitation in physics, which states that the gravitation attraction between two objects is proportional to their masses and inversely relates to the square of their distance. The basic form of the gravity equation is as follows:

$$F_{ij} = \frac{M_i M_j}{D_{ij}^2} \tag{1}$$

where  $F_{ij}$  is the gravitation attraction,  $M_i$  and  $M_j$  are the masses of two objects and  $D_{ij}$  is the distance. Tinbergen(1962) had applied this gravity model to analyze international trade flow in 1962 and many researchers have followed this model to analyze in bilateral

trade. The model is as follows:

$$T_{ij} = A \frac{Y_i Y_j}{D_{ij}} \tag{2}$$

where  $A$  is a constant,  $T_{ij}$  is the total trade flow from country  $i$  to country  $j$ ,  $Y_i$  and  $Y_j$  are the economy size of country  $i$  and country  $j$ , normally gross domestic product(GDP).  $D_{ij}$  is the distance between country  $i$  to country  $j$ .

The above equation can be reformulated after taking logarithm and we got a correspondent estimable equation as:

$$\ln T_{ij} = \alpha + \beta_1 \ln(Y_i Y_j) + \beta_2 \ln D_{ij} + u_{ij} \tag{3}$$

In this paper we use some proxy variables for the mathematical equation of this basic formulation of the gravity model formulated as:

$$\begin{aligned} \ln EXPORT_{bj} = & \alpha + \beta_1 \ln(GDP_{bt} * GDP_{jt}) + \beta_2 \ln DIST_{bj} \\ & + \beta_3 \ln INFLA_{jt} + \beta_4 \ln FDI_{bt} + \beta_5 \ln EXRT_{bjt} + \beta_6 \ln INFLA_{bt} \\ & + \beta_7 \ln(EXPT_{bj} / GDP_j) + \beta_8 landlocked + \beta_9 coborder + u_{bjt} \end{aligned} \tag{4}$$

where  $Export_{bj}$  denotes total garments export from country  $b$  (Bangladesh) to country  $j$ .  $GDP_b * GDP_j$  indicates gross domestic product of Bangladesh and country  $j$ .  $FDI$  indicates foreign direct investment in Bangladesh,  $EXRT_{bj}$  indicates cross exchange rate between country  $b$  and country  $j$ ,  $INFLA_{jt}$  denotes inflation rate of partner countries,  $INFLA_{bt}$  indicates the inflation rate of Bangladesh.  $EXPT_{bj}/GDP_j$  is export GDP

ratio of partner's countries.  $DIST_{bj}$  indicates the distance from country  $b$  to country  $j$ ,  $landlocked$  indicates dummy of landlocked partner countries,  $co-border$  indicates common border with Bangladesh, the parameters  $\beta$  are the coefficients to be estimated,  $u$  denotes error term,  $t$  denotes time period and  $\ln$  indicates natural log. All these trade values are in log form.

There are some zero flows or missing in data set of bilateral exports. However, omitting zero flows can give us biased as well misleading results. In this case, these zero trade value makes a problem for estimation of the gravity model in the log-linear form because logarithm of zero is undefined. Zero values may be substituted by a small constant. This approach has been followed by Linneman (1966), and Raballand(2003). Substituting with small values avoids the omission of observations from the sample (Linders, 2006).

Matyas et al(2004), Egger(2000) suggest the applying panel data in a gravity model because panel data is a general case of cross sectional data and time series data. Many studies are usually using the gravity model with single year cross-sectional data or time series data. But due to the problem of misspecification and controlling of heterogeneity, these methods are giving biased results(Cheng and Wall, 2005). Therefore, here a panel framework is constructed to estimate the above equation during a period of 1990-2011. The estimation has several advantages over cross section data and time series data because time series and cross section studies do not control for the

heterogeneity and it may give biased estimated results, while panel estimation controls for individuals heterogeneity. It can also measure the effects that are not detectable in cross sections and time series data (Badi, 1995).

## 2. Definition of variables

Gross domestic product ( $GDP_b * GDP_j$ ): It is one of the independent variables that is considered as the main actor in the basic model. Bangladesh's GDP or its trade partner's GDP is the source of power for increasing the export of garments. A large size of exporting country indicates a large size of production which increases the availability of goods for exports. Therefore it is expected that coefficient for this variable to be positive. Large size of importing countries suggest larger imports, therefore it is also expected that coefficient for this variable to be positive.

Export GDP ratio ( $Export/GDP_j$ ): Export GDP ratio variable indicates the trade openness of the country. Larger openness of the country may lead more trade with partner countries. Therefore, expected sign is positive.

Distance (DIST): Distance between two countries is expressed as the distance (in km) between the capital cities. Distance has a negative impact on the volume of exports. As the distance between the exporting and importing country becomes longer, exports will fall. The distance is used as a proxy to consider the impact of transportation cost and other transaction costs. Therefore the coefficient for these variable is expected to be

negative.

Exchange rate (EXRT): Exchange rates are available in each currency per US dollar. So these rates are converted into Bangladesh's currency (country b's currency), in short, cross exchange rate. Devaluation of the domestic currency is to initiate the export of the nation. If domestic currency is devaluated more, Bangladesh's garments exports will be larger, which implying a positive relationship between RMG export and devaluation of domestic currency. The exchange rate data are in BDT per foreign currency and therefore coefficient estimation expected to be positive.

Foreign direct investment(FDI): FDI is the best way to increasing the economic capacity of a nation, which implies that, the successive attraction of FDI would result in an enlargement of the exporting capacity. Estimation expects positive sign.

Inflation rate(INFLA): This variable indicates the price of goods and services. A high inflation rate of importing country means that there is more benefit for Bangladesh garments to be exported with low price. So we expect a positive sign for  $INFLA_j$  and the negative sign for  $INFLA_b$ .

Border: This is the dummy variable for country sharing the common border. The sharing border with Bangladesh might imply the increase in the export between two countries. Coefficient for this variable is expected positive.

Landlocked: This is also dummy variable for the landlocked countries. It is also expected that coefficient for this variable to be negative.

### 3. Sample size and Data source

Our study covers 38 countries. The data has been collected for the period of 1990 to 2011 (22years). We cannot go further because export data of some countries for the later period were not available. All observations are annual. All these data(GDP, Inflation rate, FDI, Exchange rate) are collected from the world development indicators(WDI) database of the World Bank. Data on Bangladesh's RMG export are from UN Comrade Database. Data for the distance (km) between Dhaka(capital of Bangladesh) and partner countries capital city are collected from the website: [www.indo.com/distance](http://www.indo.com/distance).

GDP & FDI are measured in million US dollar. Bangladesh's RMG exports are measured in thousand US dollar. Data on exchange rate are available in national currency per US dollar for all countries. So these rates are converted into the countries j's currency (partners country's currency) in terms of Bangladesh's currency (country b's currency), in short, cross exchange rate. The Inflation rate (INFLA) are computed from CPI data of the country. So this rate are measured by the formula of  $(CPI_t - CPI_{t-1}) / CPI_{t-1} * 100$ .

### 4. Model test

We implemented a model selection test to find out a proper model which fits well for our objects since there is more than one candidate model. We used Hausman test to choose one model between fixed effect model and random effect model.

<Table 2> Hausman test results

variables	Coefficients			
	Fixed (b)	Random (B)	b-B	S.E.
GDP <sub>b</sub> *GDP <sub>j</sub>	.698	.989	-.291	.010
EXPT <sub>bj</sub> /GDP <sub>j</sub>	1.010	1.020	.001	-
Infla <sub>j</sub>	.222	.013	.208	.019
Infla <sub>b</sub>	-.882	-1.860	.985	.030
Exrt <sub>bj</sub>	.005	.002	.003	.001
Fdi	.003	.023	-.020	-
P> χ <sup>2</sup>	.000			

The test result shows that the p-value is 0.00 which is less than 0.05. This value suggests that the fixed effect model is better than the random effect model. Therefore, direction of the analysis effort focuses on the fixed effect estimation.

We now assume the gravity equation for a country pair may have a unique intercept and that it may be different for each direction of trade. However, the slope coefficient is assumed to be constant over time and across trading pairs.

We use the OLS estimation to find out the country effect with the help of panel data for the period of 1990 to 2011. We have followed individual effect to estimate the impact of time-invariant variables, suggested by (Cheng and Wall, 2005)

$$\ln EXPORT_{bjt} = \alpha_{bj} + \beta_1 \ln(GDP_{bt} * GDP_{jt}) + \beta_2 \ln INFLA_{jt} + \beta_3 \ln FDI_{bt} + \beta_4 \ln EXRT_{bjt} + \beta_5 \ln INFLA_{bt} + \beta_6 \ln(EXPT_{bj} / GDP_j) + u_{bjt} \tag{5}$$

where  $\alpha_{bj}$  is the specific country effect of the trading partners. The country pair intercepts

include the effects of all omitted variables that are cross section specific but remain constant over time. The fixed effect model is not able to identify the impact of time-invariant variables such as distance, the common border and landlocked. Therefore, estimated country pair effects are regressed on the time invariant variables to find out the importance of these variables (Cheng and Wall, 2005). The following regression is considered:

$$\alpha_{bj} = \alpha_1 + \alpha_2 \ln DIST_{bj} + \alpha_3 coborder + \alpha_4 landlocked + v_{bj} \tag{6}$$

Where,  $\alpha_{bj}$  is the specific country-pair effect of the trading partners. It is expected that  $\alpha_2 < 0$  and  $\alpha_4 < 0$  and  $\alpha_3 > 0$ .

## 5. Export Potential

Maurel and Cheikbossian (1998), Montanari (2005) applied point estimated coefficient on explanatory variables to calculate the trade potential, which was predicted by gravity model. Then this trade potential had been

compared with the actual trade to identify whether bilateral trade between two countries had been overused or underused. Calculating export potential is a line of research that has been used intensively with the gravity model. Most of the studies apply the point estimated coefficient on the explanatory variables to calculate trade potential predicted by gravity model. This study has calculated export potentials with the help of following three formula.

*P-A: Predicted export flows - actual export flows*

Predicted export flows are calculated based on the gravity model. Positive value of P-A shows that there is a future possibility of export expansion and negative values show that Bangladesh has exceeded its export potential with the particular country (Batra, 2004 and Rahman, 2009).

*P/A: Predicted export flows / actual export flows*

If this ratio value exceeds one, there is an implication of potential expansion of Bangladesh's exports with the respective countries and vice versa (Batra, 2004 and Rahman, 2009).

### *Speed of convergence*

Jakab et al.(2001) have proposed the concept of speed of convergence to replace the old method to calculate potential trade. The speed of convergence is defined as the average growth rate of potential trade divided by the average growth rate of actual trade during the years of observations.

If the growth rate of potential trade is smaller than that of actual trade, computed speed of convergence will be negative, and we posit divergence in the opposite case. We use this method for avoiding uncertain point estimation for potential export.<sup>2)</sup>

## V. Estimation results and discussion

### 1. Estimation of gravity model

The estimation results of bilateral exports of Bangladesh with 38 countries have been reported in table 3. The gravity model of Bangladesh's exports has been estimated by fixed effect model. The F-test has been carried out for the null hypothesis that the country specific effects are jointly zero.<sup>3)</sup>

2) But we should note that it may not be true convergence measure in some sense. For example, in order to indicate convergence, the measure should be negative, if potential trade is higher than actual. But it should be positive if potential is smaller than actual market size (Jakab et al., 2001).

3) The F-test statistic (not shown in the table) is 10.87 (6 and 792 d.f.) which is far larger than critical value, which supports the alternative hypothesis indicating all the coefficients in this model are not zero. This result means 38 partner countries have different propensities to export with Bangladesh.

&lt;Table 3&gt; Gravity model result

	Fixed effect model		
	coeff	Robust S.E.	p value
$GDP_b * GDP_j$	.690	.028	0.000***
$EXPT_{bj} / GDP_j$	1.010	.001	0.000***
$Infla_j$	.222	.053	0.000***
$Infla_b$	-.882	.098	0.000***
$Exch_{bj}$	.005	.003	0.060*
Fdi	.003	.002	0.200
Constant	-6.020	1.020	0.000***
$R^2$ 0.99, Observation	836		

\*, \*\*\* denotes the significance at the 10, 1 % level.

Most of the variables are highly significant with expected sign at the 1% level. The positive sign of the coefficient of ( $GDP_b * GDP_j$ ) indicates that Bangladesh tends to more RMG exports with larger economies and growing ( $GDP_b * GDP_j$ ) of Bangladesh promotes its RMG export capacity with 38 partner countries. The coefficient of the exchange rate is significant with a positive sign. According to the J-curve approach, the bilateral exchange rate and exports are inversely related. That condition happens in this estimation of the bilateral exchange rate and RMG exports of Bangladesh. The devaluation of domestic currency would increase the RMG export level. On the other side, this effect will be negated that importing raw materials would be costlier.

The inflation of 38 partner countries ( $INFLA_j$ ) is highly significant with expected sign, which implies that if the partner countries cost more to produce the product due to the inflation then Bangladesh will get the benefit to export with a lower price tag. On the other hand, the inflation rate of

Bangladesh ( $INFLA_b$ ) is highly significant with the negative sign. This indicates that if garments manufacturing cost becomes more, Bangladesh can lose RMG market all over the world. The openness variable ( $EXPT_{bj} / GDP_j$ ) affects the Bangladesh's garments export positively. The variable was statistically significant. Foreign direct investment is insignificant but estimated coefficient has expected sign.

Now in Table 4 the countries effects are reported from the above estimation, where Sri Lanka followed by Nepal, Pakistan, and Egypt had the highest propensity with Bangladesh. On the other hand, Belgium followed by Japan, USA, UK had the lowest propensity with Bangladesh's RMG exports during 1990-2011.

## 2. Country specific effects

The model result shows in Table 5 that the distance variable is highly significant at 1% level with the expected negative sign. The implication is that one percent decrease of the distance between two nations will generate 3.74% increment on RMG export from Bangladesh.

&lt;Table 4&gt; Country effects

country	effect	country	effect
Sri Lanka	13.14	Indonesia	3.95
Nepal	10.68	Saudi	3.54
Pakistan	9.38	Philippine	3.49
Egypt	8.33	Switzerland	3.01
New Zealand	7.77	Australia	1.98
Singapore	7.62	Canada	1.65
Denmark	6.35	Spain	1.47
Malaysia	6.16	Mexico	0.34
Finland	5.83	S. Korea	0.32
Hong Kong	5.78	Italy	-0.16
Portugal	5.44	France	-0.34
Norway	5.21	India	-0.56
Greece	5.08	Germany	-1.28
Thailand	5.01	Brazil	-1.94
Turkey	4.89	China	-2.20
Sweden	4.83	UK	-3.45
Poland	4.59	USA	-5.73
Netherland	4.02	Japan	-6.16
Austria	3.95	Belgium	-8.23

&lt;Table 5&gt; Individual effects regressed over distance and dummies for landlocked and border

variables	coefficient	p-value
Distance	-3.74	0.00***
Landlocked	2.92	0.29
Co-border	-5.83	0.15
Constant	35.23	0.00***
R <sup>2</sup>	0.24	

The landlocked and border dummy are not significant at 5% level with the unexpected sign which means landlocked and border does not affect Bangladesh's RMG export. A little bit low R<sup>2</sup> coefficient (0.28) means that there might be other determinants of the trading pair effects (which have not been included in the analysis).

### 3. Bangladesh's RMG export potential

The gravity model is not only useful to find out determinants of bilateral exports flows. It can also be used to predict future trade flows or export flows. In particular, it is used to calculate export potentials i.e. the difference between the predicted and the actual bilateral export flows. After obtaining the estimated



result of the gravity model, we have used the estimated coefficient to predict Bangladesh's RMG export with all the countries in our sample.

The ratio of export potential (P) as predicted by the model and actual trade (A) was also used to analyze the potential RMG export of Bangladesh. If the value of P/A exceeds one, there is a potential expansion of exports with the respective partner countries (Batra, 2006). The value of (P-A) has also been used to find out the potential for export expansion with Bangladesh over a period of time. A positive value indicates future possibilities of export expansion while a negative value shows that Bangladesh has

exceeded its export potential with partner countries. Bangladesh's exporting partners are divided into two groups: these two groups of countries are presented in table 6 and appendix table A-1. Table 6 shows the potential countries for RMG export expansion of Bangladesh and table A-1 shows those countries with which Bangladesh already exports more than its export potential.

In table 6 Bangladesh has the highest potential for USA and Japan and the lowest potential for Australia during the period of 1990-2011. For the countries where Bangladesh has already exceeded its trade potential are skipped for space saving.

<Table 6> Positive potentials for RMG export

countries	P	A	P-A	P/A
USA	33.747	19.606	14.141	1.721
Japan	29.151	15.927	13.223	1.830
Belgium	14.322	3.434	10.887	4.169
China	23.637	15.299	8.338	1.545
Germany	25.977	17.198	8.779	1.510
Brazil	20.599	14.060	6.539	1.465
France	24.077	18.119	5.957	1.328
UK	23.841	18.297	5.543	1.302
Italy	23.106	17.591	5.514	1.313
India	19.010	13.529	5.480	1.405
Mexico	18.670	14.681	3.988	1.271
Korea	18.355	14.590	3.765	1.258
Spain	19.861	16.879	2.981	1.176
Canada	20.005	17.230	2.774	1.160
Australia	17.109	15.503	1.605	1.103

P: Potential, A: Actual. US\$1,000

#### 4. Speed of Convergence

As mentioned above, we define convergence if the growth rate of potential is lower than

that of actual exports and the computed speed of convergence is negative. The divergence is in the opposite case.<sup>4)</sup> The speed of convergence exploits the dynamic structure of

the data during the estimation. This approach seems to offer more reliable method than the analysis of point estimation (Jakab et. al, 2001).

Results for the speed of convergence are divided into two groups under the situation of  $P>A$ ; converging countries and diverging countries. In the converging group, the

potential export is greater than actual export ( $P>A$ ) and growth rate of potential export(GP) is less than the growth rate of actual export (GA), thus computed speed of convergence is negative. In the divergence group, the opposite case ( $P>A$  and  $GP>GA$ ) applies, which is shown in table 7. Both countries in table 7 are diverging.

<Table 7> Convergence countries (percent)  $P>A$  and  $GP<GA$

Countries	GP	GA	GP/GA*100-100
Canada	0.051	0.052	-2.037
Spain	0.051	0.053	-2.680
Korea	0.056	0.059	-5.652
Mexico	0.055	0.058	-6.181
India	0.055	0.061	-10.790
UK	0.042	0.049	-14.268
Italy	0.043	0.051	-14.586
France	0.042	0.050	-15.961
Brazil	0.050	0.063	-20.159
China	0.045	0.058	-22.014
Germany	0.038	0.050	-23.602
USA	0.029	0.047	-36.403
Japan	0.034	0.055	-37.858

From the analysis, Bangladesh seems not to have exploited all the potentials in RMG exporting with partner countries. Export between Bangladesh and 38 partner countries still have a large space for growth. Bangladesh has unexploited export potential for 15 convergence countries and has exploited export potential for 23 partner countries. Table 7 shows that USA followed by Japan and Germany are not fully utilized by Bangladesh's

RMG industry.<sup>5)</sup>

## VI. Conclusion

Readymade garments industry is the main source of revenue for Bangladesh. It is the backbone of the nation's economy in generating foreign exchange and helping the economy to have a better performance. This

4) As mentioned above, note that this is true only when potential is larger than actual ( $P>A$ ). Thus we, in this section, consider only  $P>A$  case in the following explanation.

5) For diverging countries, we do not report the calculated results in detail for the space saving.

study tried to access the demand and supply side factors on Bangladesh's readymade garments focused on the international trade. Moreover, it also tried to see whether there are more rooms to export in the partner countries by using the gravity model estimation.

The estimated result shows that Bangladesh's RMG exports are influenced positively by economy size (GDP), inflation, exchange rate, foreign direct investment (FDI) and openness variable ( $EXPT_{ij}/GDP_j$ ). On the other hand, RMG export is affected negatively by the distance between trading partners. These results are consistent with what the gravity equation and other theoretical approaches.

The result also shows that Bangladesh has the highest potential for USA and Japan and the lowest potential for Australia during the period of 1990–2011. Furthermore, Bangladesh has already exceeded its trade potential with Sri Lanka, Pakistan, New Zealand, and Egypt. If Bangladesh wants to export more RMG products in order to obtain better economic performances, she needs to focus on these results and to be more considerate when she consider the trading partners.

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## 요 약

### 중력모형을 이용한 방글라데시 의류 유망 수출시장 추정

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본 연구에서는 방글라데시 의류(ready made garment) 산업과 그 수출 시장을 분석하고 장래에 수출시장으로서의 가능성을 계산하였다. 먼저 방글라데시 의류산업의 수출 현황을 실제 무역데이터를 이용하여 분석하였다. 수출상대국과의 무역량과 방향을 이용하여 무역구조를 제시한 후 중력모형을 이용하여 38개 수출국에 대해 수출결정 요인을 탐색하였다. 계량분석 모형으로는 패널데이터에 대한 회귀 분석 모형을 이용하였으며 고정효과모형, 확률효과모형을 제시하고 하우스만 검정을 통해 모델선택을 다루었다. 이러한 분석으로부터 중력이론에서 제시하는 수출대상국의 경제규모, 거리 뿐 아니라 환율과 인플레이션 등도 수출 결정에서 중요한 변수임을 확인하였으며, 수출결정식의 고정효과를 추정하여 수출 상대국들의 잠재적 시장크기를 추정할 수 있었다. 그 결과 가장 유망한 수출시장은 미국과 일본임을 발견하였다. 그러나 Sri Lanka, Pakistan, New Zealand, Egypt들은 이미 잠재수출량을 초과하였음을 보였다. 또한 현재 잠재적 수출시장의 크기에 비해 수출이 적은 국가의 경우 잠재시장 규모와 현실 수출 규모 사이에 수렴하고 있는 경향이 있는가를 측정하였으며 수렴률을 제시하였다. 마지막으로, 만일 방글라데시가 이 분야 수출을 증가시키고자 한다면 이러한 결과에 유의하여 시장 진출 전략을 수립하여야 함을 지적하였다.

핵심주제어: 방글라데시, 봉제산업, 수출, 의류산업, 중력모형, 유망수출국

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