Master Thesis

A Panel Data Analysis of Bangladesh's Textile and Clothing Export: The Gravity Model Approach

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The Graduate School of Hansung University

Major in International Market Analysis

Dept. of International Trade and Economics

Rashid Md Mamun Ur

Master Thesis

Advisor Professor Jaewhak Roh

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- 방글라데시 섬유 및 의류 수출 패널 데이터 분석: 중력 모델 접근 -

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Abstract

A Panel Data Analysis of Bangladesh's Textile and Clothing Export: The Gravity Model Approach

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The Purpose of this thesis paper is to determine the factors that influence the export of Bangladesh's textile and clothing with 10 major trade partners. To analyze and conduct the research a panel data set has been generated to estimate the panel gravity model of Bangladesh's textile and clothing export to a total of 10 major trade partners over a period of 16 years from 2000 to 2015. There are few tests have been done including regression analysis, Fixed effect model, Random effect model and Hausman test to select between Fixed effect model and Random effect model. The dependent variable of this study is Export of textile and clothing and the independent variables are GDP of Bangladesh, GDP of Partners country, Geographical distance, CPI(Consumer Price

Index), landendownment(Total land area of Bangladesh and Partner country), Tariff rate of Bangladesh and Tariff rate of Partner country. The study shows that the Geographical distance does not have any negative impact on the export of T&C(Textile and Clothing) but the P value is very significant. The land area and CPI have negative coefficient and P value is very significant. One the other hand, Tariff of Bangladesh and Tariff of partner country have positive coefficient but the P value is not that significant. The research study is a remarkable contributor for the export of T&C industries in Bangladesh. And this research will help find more insights and pave a new way for further research in the future.

Keywords: Bangladesh, Textile and Clothing, GDP, Regression analysis, Fixed effect model, Random effect Model, Hausman test, Geographical Distance, CPI, Tariff, Land area.

Table of Contents

List of Figures

List of Tables

Section 1: Introduction

Bangladesh is a South Asian developing nation over 160 million population in total. Textile and clothing is the biggest contributor to the GDP of Bangladesh. Export of Textile and clothing plays a significant role in the Economy of Bangladesh as it is a vital source of foreign exchange earnings. Even though, Bangladesh is a developing small country, in terms of Textile and clothing industry it has surpassed other countries. Due to less wages, the garments products in Bangladesh is very cheap than most of other countries like China, Vietnam and Thailand. As of 2020, almost 5 million people are employed in Textile and clothing industry. Textile and clothing industry not only created a huge number of employment but also became the largest export and money maker for the country. The weather and seasons of Bangladesh is not in favor of making raw materials that are used to make textile and cloths. Most of the raw materials are imported from Uzbekistan. The biggest advantages for the country are cheap labor cost and long working hour. In term of garments products cost, no other country can defeat Bangladesh has the huge unemployed population who are willing to work with minimum wages and Garments industry cover this huge unemployment gap providing minimum wage. The employees can work long hour. Md. Samsul Alam and Kaoru Natsuda's survey of Bangladeshi garment industry, conducted in 2012, found that they almost unanimously credited the low cost of labor as the main contributor to the industry's growth in Bangladesh. Gas energy and electricity is cheap compared to other countries which also help textile industry grow faster. Despite having a

lot of advantages, the textile and clothing industry face a lot of challenges. One of the worst known issues is safety for the workers. As the industry must produce huge products to export, they hardly maintain the safety for their employees which cost many deaths. One of the incidents that happened in 2013, the garments industry building named Rana Plaza collapsed and killed 1100 people. The working environment in the industry is not up to the mark. After this incident the industry receives a lot of criticism and became concern about the safety. The government also started working on increasing safety standards.

There are many factors that helped the textile and clothing industry to export products globally. In 2017 Bangladesh's textile export to the world was us$32.8bn which was around 6,5 percent of the world market. The industry stared to contribute consistently to the GDP of Bangladesh since 2004. Bangladesh joined in WTO (World Trade Organization) in 1995 which created a lot of chances for the industry to develop, especially in the international trade. Moreover, the country started to get trade benefits after having been a member of WTO and it expanded the export market and export goods internationally. Market access and trade policy also plays a vital role for this industry as Bangladesh's main target of export is EU (European Union) and United states. Bangladesh is one of the GPS (Generalized System of Preferences) countries which allow them to export to Japan with no tariff. That is a big reason Japanese company in Bangladesh is increasing.

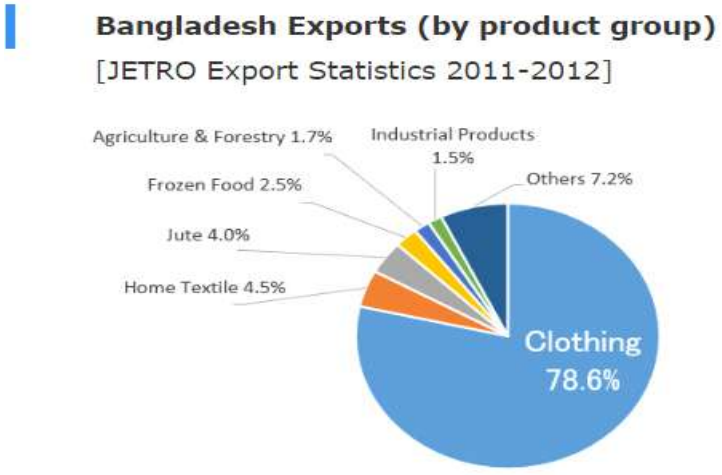

Figure 1:Bangladesh Export by products group

Source: United nations industrial development organization

In the pie chart of figure 1, In 2011-2012 the total export of clothing accounted for 78.6% which was the largest among other industries in Bangladesh.

The total export value from this industry was US$ 23.5 billion in 2013 which put Bangladesh in second place after China.

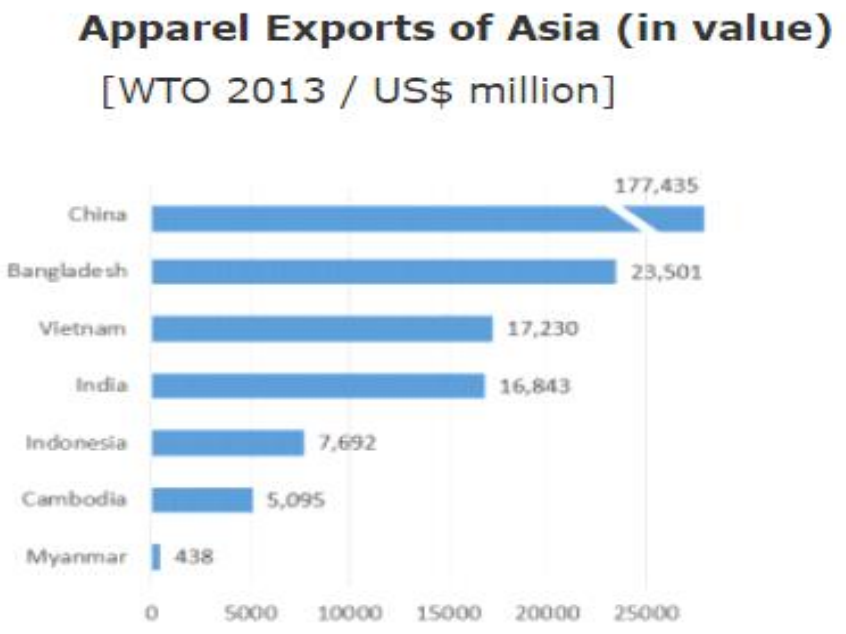

Figure 2:Apparel Exports of Asia

Source: United nations industrial development organization

The chart below shows that the global market share by export of clothing from 2015 to 2019. There is a sudden growth of clothing export in 2019 which was 6.8 percent of the global market share. This sudden growth was due to trade war between US and China.

Figure 3:Bangladesh Global Clothing Export Market Share Perchantage

Source: Textile Today Bangladesh(data from World Trade Organization)

The chart below indicates the export value of Ready-Made Garments (RMG) Products of Bangladesh from 2012 to 2021. It is seen that the highest export value by year was US$34.13 billion in 2019. Then, in 2020 the value decreased to US$27.95 billion and started recovering in 2021. This decreased after 2019 was due to global pandemic (Corona virus).

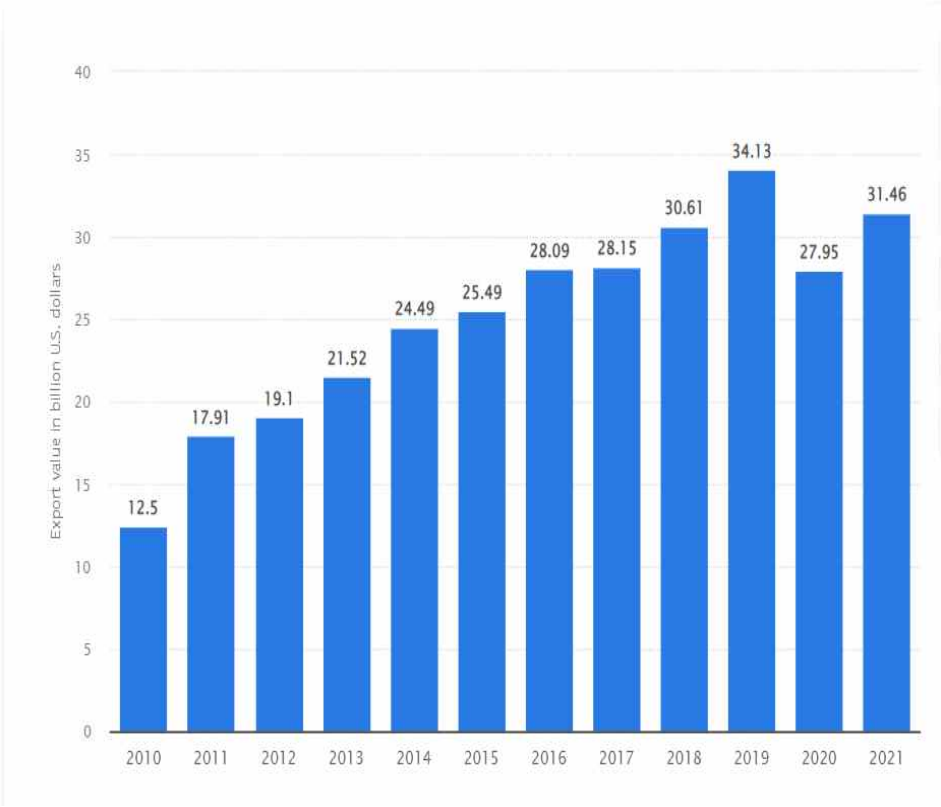

Figure 4:Export value of Bangladesh by year

Source: Statista.com (Statista 2022)

This research paper is based on gravity model of panel data analysis. The dependent variable of this study is Export of textile and clothing and the independent variables are GDP of Bangladesh,GDP of Partners country, Geographical distance (Consumer Price Index), landendownment(Total land area of Bangladesh and Partner country), Tariff rate of Bangladesh and Tariff rate of Partner countryThere are several tests have been done to find out the major determinants of export of textile and

clothing. The whole paper is divided into 6 sections. In the first section, Introduction and overview of international textile and clothing industry are discussed. In the second section, Research design including objectives of the study and hypothesis of the study are given. In the third section literature review is given. In the fourth section, data methodology has been written. In this section panel regression, Fixed effect model, Random effect model and Hausman test are discussed. In the fifth section, there is result and discussion about Descriptive analysis, Regression analysis, Fixed and Random effect model and Hausman test. And finally in the sixth section, conclusion, research implication and limitation references, list of websites are given.

The research study is a remarkable contributor for the export of T&C industries in Bangladesh. And this research will help find more insights and pave a new way for further research in the future.

1.1 Overview of International Textile and Clothing Industry

The global textile industry is a multibillion-dollar manufacturing sector that comprises the production, refining, and sale of synthetic and natural fibers utilized in thousands of sectors. The textile industry employs between 20 million and 60 million people around the world. The garment business employs a large number of people in developing countries like India, Bangladesh, Pakistan, and Vietnam. The industry accounts for about 2% of global GDP. China is the largest producer and exporter of both raw textiles and finished clothes in the world. The United States is the world's largest producer and exporter of raw cotton, as well as the world's largest purchaser of raw textiles and clothing. Countries like Bangladesh, Pakistan and Vietnam are moving forward very fast making textile and clothing industry bigger. Since labor cost is low in developing country, there is a huge chance for extending this industry as China is moving forward to making service-based industry.

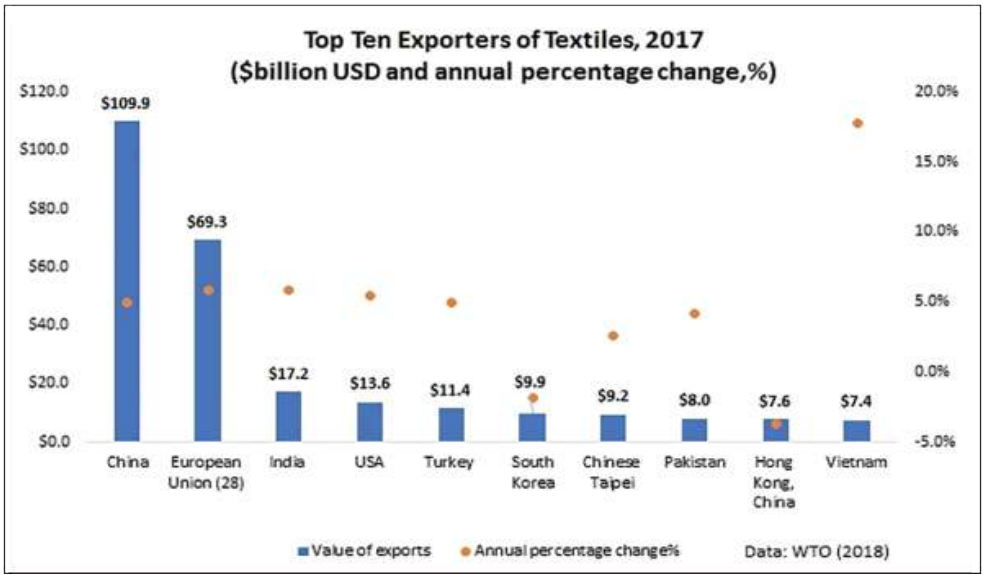

Figure 5: The World's Top 10 Exporter of Textile in 2017

Source: WTO.

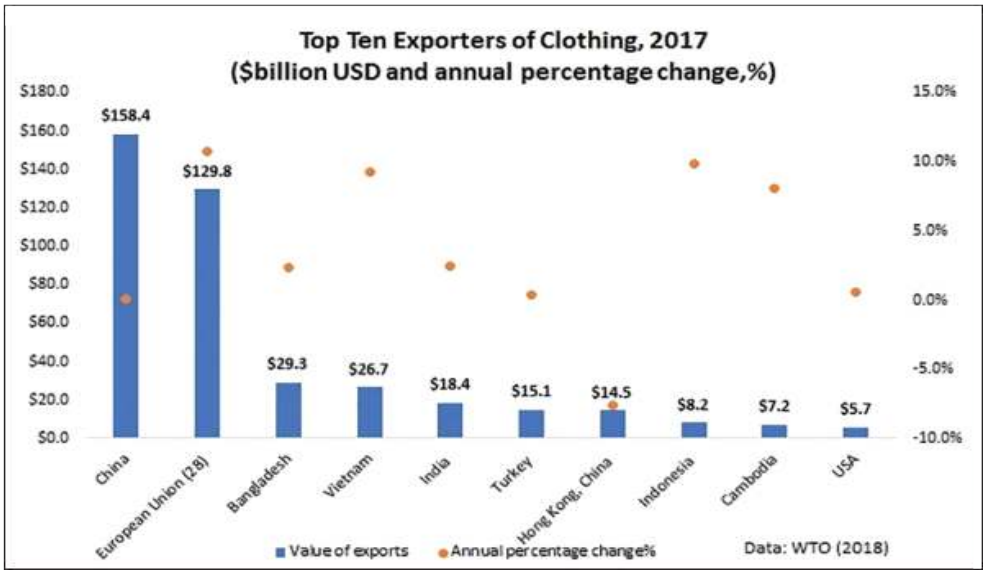

Figure 6:Top Ten Exporter of Clothing In 2017

Source: WTO.

In the figure the chart shows the top ten exporter of textile in

2017. It is seen that the China exported the highest amount of textile products which is estimated USD$ 109.9 billion. Following by European Union, India, USA, Turkey exported USD $69.3, $17.2, $13.6 and $11.4 billion respectively. In terms of exporting textile Bangladesh could not make it to top 10.

In the figure 2, the chart demonstrates about the top ten exporters of clothing in 2017. In the figure 2, It is noticed that China exported highest amount of clothing which was USD $158.4 and then European Union exported the second highest amount of clothing which is estimated USD $ 129.8 billion. And Bangladesh was the third highest exporter of clothing. Bangladesh exported USD$ 29.3 billion in that year, following by Vietnam and India exported USD $ 26.7 and $18.4 billion respectively.

Section 2: Literature review

International trade is frequently explained using the gravity model. It was originally derived from the physics equation of gravity by Newton. Recently, several places have analyzed the trade gravity model's theoretical aspects (Anderson, 1979; Anderson, 2011; Shahriar, Qian, Kea, & Abdullahi, 2019). Cardinale and Scazzieri (2019) have recently claimed that issues of market regulation, industrial promotion, and international commerce have been framed in terms of national welfare from the early 17th century. In other words, the population of a nation is impacted by the welfare of international trade.

According to Tinbergen (1962), who advocated the creation of the fundamental gravity model, the volume of commerce with any given country's trading partners is directly correlated with that country's national income and vice versa. According to the theory (Dell'Ariccia, 1999), nations with larger economies favor trading more in absolute terms, but distance (a proximate indicator of transportation costs) would reduce bilateral trade.

Absar (2002) in his paper on Bangladeshi women garment workers found out Women from Bangladesh move to urban areas in quest of employment. The working environment is appalling, and earnings are low. This is made worse by the lack of adequate,

affordable housing, access to transit, and social security that metropolitan women experience.

Bhatachariya (2004) Using the gravity model and several scenarios of tariff reduction, simulated results and evaluated the bilateral trade flows between India and Bangladesh. These results offered additional proof that India's exports will grow more quickly than Bangladesh imports.

Rahman (2006), panel data analysis of Bangladesh's trade. The study shows Bangladesh's exports are strongly influenced by the estimation of its economies, the disparity in the countries' per capita gross national product (GNP), and the openness of the trading partners.

Chan and Au (2007) in their paper on China's Textile export mentioned the following factors have all been identified as having a substantial impact on China's textile export: GDP, real trade rate, common enrolment of free exchange assertion for two-sided exchanging partners, per capita GDP, and population growth rate of the export country.

Ahmed (2009) demonstrates that Bangladeshi clothing did have access to a guaranteed international market because to national and

international multi-fibre agreement quotas.

Amann, Lau, and Nixson (2009) This article investigates the effects of China's growing T&C sector on the exports of its Asian competitors using a gravity model. It demonstrates how China's Open Door Policy boosted T&C export.

Amann et al. (2009) In this study, the gravity model was used to analyze how China's T&C industry affected the export performance of Asian T&C producers between 1990 and 2005. To the T&C exports of other Asian economies, China's textile exports posed a greater competitive threat than its clothing exports. Asian economies with greater incomes performed better than those with lower incomes. This is because of the higher-income Asian economies' propensity to specialize in T&C industry sectors that are less vulnerable to Chinese competition.

Mohammad Mafizur Rahman (2010) tries to identify the variables that affect Bangladesh's export. The export trade form is found using a panel estimation technique. According to the estimated results, Bangladesh's exports are mostly influenced by its economy's openness, the exchange rate, and the total import demand of its trading partners. These have a favorable impact on Bangladesh's

exports. The cost of transportation has a negligible but adverse impact on Bangladesh's exports. The results for each country indicate that Bangladesh's exports are more significantly impacted by its neighbors than by other far-off countries. Bangladesh should therefore lower trade restrictions, pursue competitive currency depreciation, increase commodity efficiency, and broaden its product line.

The benefits of trade under the SAARC countries' free trade agreement are discussed in (Akhter & Ghani, 2010). It investigates the establishment of commerce between Member States and Non-Member States as well as trade potential. The international trading flows for both members and non-member nations were calculated using the gravity model, and the effects on trade were evaluated. Two investigations into the gravity model are evaluated. The initial research focuses on cross-sectional statistics for each year, and the subsequent analytical analysis analyzes the combined data to estimate the entire impact of trade and trade flows between 2003 and 2008. The results from both approaches show that the projected coefficients match the model presumptions.

Prasai (2014) Using pooled ordinary least square (OLS) and GDP with a one-year lag, examines the overall trade structure of Nepal. Following economic liberalization, Nepal's economy underwent a

structural transition. A gravity model is applied in this investigation to a sizable panel dataset that spans 94 trading partners of Nepal over a 29-year period. The results appear impervious to specification, trade determinants, and temporal constraints. According to a norm in this field, this study separates exports from imports rather than using the whole volume of commerce. The analysis shows positive economic dimensional coefficients and negative distance coefficients, which is consistent with the simple gravity model. After economic liberalization, there is no significant systemic divide in trade determinants. The results of the simulation, which contrasted actual trade with predicted trade, demonstrated that Nepal's trade is not distorted by political actions, such as the economic sanctions imposed by other nations. The results also demonstrate that, in comparison to China, commerce with India is significantly larger. The results demonstrate Nepal's desire to diversify trade generally and to gain from trade deals with China specifically.

Nolintha and Jajri (2014) demonstrate that Laotian garment companies have significantly advanced their technological capabilities, and that firm performance and technological capabilities are influenced by the volume of exports. The level of institutional support provided by the host site determines a firm's technological capabilities, while international companies have not

made significant investments in Laos's human resources.

Khan and Milne (2018) According to their article, the Sustainable Development Goals (SDGs), a framework for development that has been universally accepted, have given global governance a new dimension. Despite being particular to Bangladesh, the RMG instance paints a broad picture of global governance and country-level engagement, an important factor in development that presents both opportunities and hazards. It has been demonstrated that Global Governance (GG) has the potential to increase economic growth and decrease poverty. However, because of its unchecked participation and national-level democratic deficits, a global/local coalition of vested interests has developed, which has led to biased policy responses and divergent macro/micro-outcomes.

Hasan et al. (2019) attempts to investigate the various facets of energy effectiveness and energy management strategies in Bangladesh's textile sector. The study demonstrates that the greatest impediment to the textile industry's growth is the dearth of technically feasible solutions, which is intimately tied to the absence of government and industry-sponsored research and development.

Ashraf and Prentice (2019) The relationship between labor unions

and labor precarity in Bangladesh's apparel industry is examined in their article. Bangladeshi workers face hazards such as precarious employment, an inability to support themselves, demeaning treatment, and attempts to prevent them from banding together for a common cause.

section 3: Research Design

3.1 Objectives of the study

In this section objectives of the study from the empirical data analysis will be explained. The accuracy of the data is also found to have methodological issues. The methodology section also contains details on the methods of analysis that will be utilized to analyze the empirical data.

The article employs the Gravity model to conduct an empirical examination of Bangladesh's bilateral trade with ten other countries. This research seeks to identify the variables that have the most impact on Bangladesh's export of textile and clothing value. Below are the two main objectives of the study are given

1. Find out the determinants factor that have impact on the export of textile and clothing industry of Bangladesh with ten major trade partners of Bangladesh.

2. Do CPI, Tariff of Bangladesh and Tariff of Partner country can be determined as a factor that can have impact on the value of export of textile and clothing industry.

3.2: Hypothesis of the study

To meet the study's major objectives, as is required in quantitative research, the Hypothesis of the research study is given below.

- The GDP of Bangladesh has significant effect on the export of textile and clothing.
- The GDP of partner country has significant effect on the export of textile and clothing.
- The geographical distance has positive significant effect on the export of textile and clothing.
- The total land area has negative significant effect on the export of textile and clothing
- The CPI (Consumer Price Index) has negative significant effect on the export of textile and clothing.
- The tariff of Bangladesh has no significant effect on the export of textile and clothing.
- The tariff of partner country has no significant effect on the export of textile and clothing.

Section 4: Research Methodology

The research encompasses a total of 10 countries. The nations were selected based on the importance of Bangladesh's trade relationship and the availability of the data. The gravity model is used to see if economic indicators like real GDP, distance between importers and exporter, Total land area, consumer price index, tariff of Bangladesh and tariff of partner countries can explain Bangladesh's bilateral trade. The data is collected of 16 years from 2000 to 2015. Regression analysis is used to see the relationship between dependent variable and independent variables. Then Fixed effect model and random effect model are also used. The Hausman test is used to pick the right model between fixed effect model and random effect model.

The Newtonian physics function, which describes the gravitational force, is comparable to the trade gravity model. According to the model, the flow of trade between two countries is proportional and invertedly proportionate to their economic "mass" (national income). This model clarifies the gravity model equation from Tinbergen (1962) and Poyhonen (1963):

The basic model of gravity model of trade is given below

$$\mathbf{Trade_{IJ}} = \alpha \frac{\mathbf{GDP_I GDP_J}}{\mathbf{Distance_{IJ}}}$$

α = constant

Trade between i country (Bangladesh) and j(partner country)

GDPi= gross domestic product of country (Bangladesh)

GDPJ= gross domestic product of country(partner countries)

Distanceij= Distance between country (Bangladesh and Partner countries)

The empirical gravity model has been explained below

$$LnExpoT\&C\ ij = aj + b1\ lnGDPi + b2\ lnGDPj + b3\ lnDistanceij + b4\ lnlandendownmentij + b5\ lnCPIij + b6 lnBDtariff + b7 lnPartnerTariff + e_{ijt}$$

i= Bangladesh

j= partner country

LnExpoT&C ij= natural log value of export of textile and clothing

lnGDPi= natural log value of GDP of Bangladesh

lnGDPj= natural log value of GDP of partner country

lnDistanceij = natural log of Distance between Bangladesh and partner country

lnlandendownmentij= natural log of total land area of Bangladesh and partner country

lnCPIij= natural log of CPI(Consumer Price Index) of Bangladesh

and partner country

lnBDtariff= natural log of tariff of Bangladesh

lnPartnerTarif= natural log of tariff of Partner country

e_{ijt}= Error term

Dataset have been generated in the excel and collected from World bank, Statistica and IMF. The mathematical equation and analysis have been done using stata15.

4.1 Research Variables

Dependent Variables= The total export of Bangladesh's textile and clothing

The independent variables are as follows

- The GDP of Bangladesh
- The GDP of partner country
- Geographical distance
- Total land area
- Consumer price index of both countries
- Tariff rate of Bangladesh
- Tariff rate of partner country

4.2 Correlation test

The purpose of correlation analysis is to see if there is a link between the variables being investigated. Furthermore, a correlation coefficient, such as Pearson's correlation coefficient, is utilized to provide a signed numeric number that shows the correlation's strength as well as direction. In this research the correlation between dependent variable and each independent variable has been done.

Pearson's Correlation Coefficient: $r_{xy} = \frac{\sum_1^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_1^n (x_i - \bar{x})^2 \sum_1^n (y_i - \bar{y})^2}}$

4.3 pooled Regression Analysis

One sort of model with constant coefficients, relating to both intercepts and slopes, is the pooled regression model. This model can be used to pool all the data and put it through an ordinary least square's regression method. In this research pooled regression has been used to see the relationship between dependent and independent variables and the effect of independent variables to the dependent variable.

4.4 Fixed effect model

Fixed-effects models are a type of statistical model in which the levels (or values) of independent variables are considered to be constant, whereas only the dependent variable varies in response to the levels of independent variables. The general linear models that underpin fixed-effects regression analysis and fixed-effects analysis of variance, or ANOVA (fixed-effects analysis of variance), are based on this class of models. By employing dummy variables to represent the amounts of independent variables in a regression model, ANOVA and fixed-effects regression analysis can be combined.

4.5 Random effect model

Less frequently employed, but possibly more frequently seen in nature, are random effects. Every level in a random effect can be viewed as a random variable drawn from an underlying process or distribution. Similar to a fixed effect, estimation of random effects offers population level data and, consequently, information about absent levels, as well as inference about the individual levels. This is frequently referred to as exchangeability, which is the theory that the levels that are supplied in a random effect aren't independent and separate but rather truly representative levels from a bigger collection of levels that might not even be noticed. Because each

level of the effect could be compared to a draw from a random variable, they are known as random effects. In other words, it is possible to think of the levels or groups in a random effect as a sample of levels drawn from a wider population of levels, some of which might not be included in the model.

4.6 Hausman test

Lagrange Multiplier tests are used to help in choosing between a random effect model and a straightforward pooled OLS model. To verify the random effects in the model, several tests are run. Null hypothesis in this case is that there is no random effect.6The Hausman Test is used to identify endogenous regressors (predictor variables) in a regression model. Endogenous variables are those whose values in a system are determined by the values of other variables. Depending on the data, the Hausman test can be used to choose between the fixed effect model and the random effect model as the best suitable model. We utilize the Hausman test to evaluate whether variables are significant in our study's panel data set because it selects the best model between the fixed effect model and random effect model.

Section 5: Result and Discussion

5.1 Descriptive Variables

Variables	Description	unit
LNExportT&C	Export of textile and clothing	Thousands in USD
LNGDPBD	Gross domestic product of Bangladesh	Thousands in USD
LNGDPPART	Gross Domestic product of Partner country	Thousands in USD
LNGEO	Geographical distance	kilometer
LANDENDOWNMENT	Land area of Bangladesh and partner country	Square kilometer
CPI	Consumer Price index	
TARIFFBD	Tariff rate of Bangladesh	
TARIFFPARTNER	Tariff rate of Partner country	

Table 1: Description of variables

Name of the Partner countries = USA, Germany, United Kingdom, France, Italy, Spain, Belgium, Canada, Netherland, Japan.

5.2 Correlation test

Correlation between dependent variable and each independent variable are given below.

1. Correlation between Textile and clothing export and GDP of Bangladesh

```
                | LN_TEX~H   LNBDGDP
----------------+------------------
LN_TEXT_CL~H |    1.0000
      LNBDGDP |    0.5691    1.0000
                       |    0.0000
```

The correlation between Textile and clothing export and GDP of Bangladesh is positive and the p value indicates that the correlation is very significant.

2. Correlation between Textile and clothing export and GDP of Partner country

```
                | LN_TEX~H LNPART~P
----------------+------------------
LN_TEXT_CL~H |    1.0000
   LNPARTGDP |    0.4250    1.0000
                          |    0.0000
```

The correlation between Textile and clothing export with GDP of partner country is positive and very significant.

3. Correlation between Textile and clothing export and Geographical distance

| LN_TEX~H LNGEO
---+---
LN_TEXT_CL~H | 1.0000

LNGEO | 0.5412 1.0000
| 0.0000

The correlation between Textile and clothing export with geographical distance is positive and very significant. Basically, the correlation between Textile and clothing with geographical distance should have been negative as when distance increases the export goes down. But here it is positive since Bangladesh export most of the textile and clothing products in USA which distance is very far from Bangladesh than rest of our chosen countries. Also, our dependent variable is only export of Textile and Clothing not both import and export. Therefore, the result came positive here.

4. Correlation between Textile and clothing export and Land_endownment(total land area)

	LN_TEX~H	LAND_E~T
LN_TEXT_CL~H	1.0000	
LAND_ENDOW~T	0.2388 0.0024	1.0000

The correlation between Textile and clothing and land area is positive and very significant.

5. Correlation between Textile and clothing export and CPI (Consumer Price Index)

	LN_TEX~H	LNCPI
LN_TEXT_CL~H	1.0000	
LNCPI	-0.4991 0.0000	1.0000

The CPI (Consumer Price Index) variable is my most important finding in this research paper. As we know when CPI increases the Economy slows down. When the price is

high, people tend to buy less which creates inflation in the economy. The correlation between Textile and clothing export is negative and the result of P value is very significant.

6. Correlation between Textile and clothing export and Tariff rate of Bangladesh

	LN_TEX~H	LNTARI~D
LN_TEXT_CL~H	1.0000	
LNTARIFFBD	-0.3120	1.0000
		0.0001

Tariff rate of Bangladesh is another finding in this research. The correlation between Textile and clothing export and Tariff rate is negative and value is very significant. When tariff rate of Bangladesh goes up the export of textile and clothing goes down.

7. Correlation between Textile and clothing export and Tariff rate of Partner Country

	LN_TEX~H	LNTARI~T
LN_TEXT_CL~H	1.0000	
LNTARIFPART	0.0588	1.0000
		0.4604

The correlation between Textile and clothing export and the tariff rate of partner country is positive and not significant.

5.3 Regression analysis

```
. xtreg LN_TEXT_CLOTH LNBDGDP LNPARTGDP LNGEO LAND_ENDOWNMENT LNCPI LNTARIFFBD LNTARIFPART

Random-effects GLS regression                   Number of obs     =       160
Group variable: country                         Number of groups  =        10

R-sq:                                           Obs per group:
     within  = 0.7861                                         min =        16
     between = 0.8242                                         avg =      16.0
     overall = 0.8080                                         max =        16

                                                Wald chi2(7)      =    563.32
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

LN_TEXT_CLOTH	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LNBDGDP	3.278832	.2434253	13.47	0.000	2.801727	3.755937
LNPARTGDP	.8203678	.3516767	2.33	0.020	.131094	1.509642
LNGEO	4.656054	1.259219	3.70	0.000	2.18803	7.124078
LAND_ENDOWNMENT	-.5105995	.2441811	-2.09	0.037	-.9891856	-.0320133
LNCPI	-.7268125	.3264851	-2.23	0.026	-1.366712	-.0869135
LNTARIFFBD	.087293	.1189958	0.73	0.463	-.1459345	.3205204
LNTARIFPART	.1868322	.2442813	0.76	0.444	-.2919504	.6656148
_cons	-73.87538	11.95545	-6.18	0.000	-97.30764	-50.44313
sigma_u	.56694327					
sigma_e	.38318237					
rho	.68643318	(fraction of variance due to u_i)				

Table 2: Pooled OLS estimation

The result in the table above shows the pooled OLS estimation. The dependent variable is Export of textile and clothing with ten other nations. Number of observations is 160 and number of groups is 10. Overall R-Squared value is 0.8080. and probability of F test is 0.0000.

The pooled OLS result suggests that if GDP of Bangladesh increases by 1% the export of textile and clothing increases by 3.27%. and the p value is 0.0000 which is very significant, and we cannot reject the null hypothesis.

Also, when GDP of partner country increases by 1% the export of textile and clothing increases by .82%. and p value is 0.020 which is significant, and we cannot reject the null hypothesis.

Geographical distance coefficients is positive here, normally when distances increases the trade decreases. The reason is that the Bangladesh export the most in the USA and Canada that two countries are far from the other chosen countries. It is due to our number of countries in the analysis. If the number of countries were bigger, then the coefficient value of geographical distance would be negative.

Next is our landendownment which is total land area of Bangladesh and partner countries. The coefficient is −.51 and the p value is 0.037.

Consumer Price Index variable indicates that when CPI increases by 1% the export of textile and clothing decreases by −.72% and the p value is 0.026 which is significant, and we cannot reject the null hypothesis.

Tariff of Bangladesh and Partner countries have positive coefficient and p value indicates that its not that Signiant and we can reject the null hypothesis.

The intercept term cannot change over time in terms of partner nation when using the pooled OLS. The employment of the random and fixed effect models in the panel analysis is crucial. The significance of the random effect and fixed effect models is

equal. We discover the model significance using the F-test. The F test's probability value is less than the 1% level of significance. However, we carry out the Hausman specification test after selecting the best model between the random and fixed effect models. The random effect model fits the null hypothesis, according to the Hausman specification test. Additionally, the fixed effect model is a suitable option.

5.4 Fixed effect model

```
. xtreg LN_TEXT_CLOTH LNBDGDP LNPARTGDP LNGEO LAND_ENDOWNMENT LNCPI LNTARIFFBD LNTARIFPART,fe
note: LNGEO omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =       160
Group variable: country                         Number of groups   =        10

R-sq:                                           Obs per group:
     within  = 0.7928                                         min =        16
     between = 0.0992                                         avg =      16.0
     overall = 0.0585                                         max =        16

                                                F(6,144)           =     91.84
corr(u_i, Xb)  = -1.0000                        Prob > F           =    0.0000
```

LN_TEXT_CLOTH	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LNBDGDP	3.227895	.2675869	12.06	0.000	2.698989	3.7568
LNPARTGDP	.5914586	.5383417	1.10	0.274	-.4726142	1.655532
LNGEO	0	(omitted)				
LAND_ENDOWNMENT	123.8655	58.60935	2.11	0.036	8.019756	239.7113
LNCPI	-.9044755	.3647653	-2.48	0.014	-1.625461	-.1834895
LNTARIFFBD	.0748344	.1188329	0.63	0.530	-.1600476	.3097165
LNTARIFPART	.186692	.2475663	0.75	0.452	-.3026413	.6760253
_cons	-246.545	102.1551	-2.41	0.017	-448.4621	-44.62779
sigma_u	165.87395					
sigma_e	.38318237					
rho	.99999466	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(9, 144) = 50.94                     Prob > F = 0.0000
```

Table 3: Fixed effect model

The above table is fixed effect model. The coefficient of GDP of Bangladesh is positive as it

indicates if GDP of Bangladesh increases by 1% the export of textile and clothing increases by

3.2%. Also, when the GDP of partner nation increases by 1% the export of textile and clothing

increases by .59 % but here the P value indicates 0.274 which is not significant, and we can reject

the null hypothesis. Geographical distance has been omitted because of repeated vales in the model.

Landendownment variable is positive here the coefficient is 123.86 and the p value is 0.036.

Consumer price Index is negative as when CPI increases the trade between countries decreases.

The p- value is 0.014 which is significant, and we cannot reject the null hypothesis. The coefficient

of Tariff of Bangladesh and Tariff of partner countries are positive and the p value indicates that

are not significant and we can reject the null hypothesis.

5.5 Random effect model

```
. xtreg LN_TEXT_CLOTH LNBDGDP LNPARTGDP LNGEO LAND_ENDOWNMENT LNCPI LNTARIFFBD LNTARIFFPART,re

Random-effects GLS regression                   Number of obs     =       160
Group variable: country                         Number of groups  =        10

R-sq:                                           Obs per group:
     within  = 0.7861                                         min =        16
     between = 0.8242                                         avg =      16.0
     overall = 0.8080                                         max =        16

                                                Wald chi2(7)      =    563.32
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

LN_TEXT_CLOTH	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LNBDGDP	3.278832	.2434253	13.47	0.000	2.801727	3.755937
LNPARTGDP	.8203678	.3516767	2.33	0.020	.131094	1.509642
LNGEO	4.656054	1.259219	3.70	0.000	2.18803	7.124078
LAND_ENDOWNMENT	-.5105995	.2441811	-2.09	0.037	-.9891856	-.0320133
LNCPI	-.7268125	.3264851	-2.23	0.026	-1.366712	-.0869135
LNTARIFFBD	.087293	.1189958	0.73	0.463	-.1459345	.3205204
LNTARIFFPART	.1868322	.2442813	0.76	0.444	-.2919504	.6656148
_cons	-73.87538	11.95545	-6.18	0.000	-97.30764	-50.44313
sigma_u	.56694327					
sigma_e	.38318237					
rho	.68643318	(fraction of variance due to u_i)				

Table 4: Random effect model

The above table is Random effect model the R squared is 0.8080. When the GDP of Bangladesh increases by 1% the export of textile and clothing increases by 3.27% and the p value indicates that we cannot reject the null hypothesis. Again, when GDP of partner country increases by 1% the export of textile and clothing increases by 082% and the p value is 0.02o which is significant, and we

cannot reject the null hypothesis. Geographical distance coefficients is positive here, normally when distances increases the trade decreases. The reason is that the Bangladesh export the most in the USA and Canada that two countries are far from the other chosen countries. It is due to our number of countries in the analysis. If the number of countries were bigger, then the coefficient value of geographical distance would be negative. Landendownment variable is negative, and the p value is significant which indicates that we cannot reject the null hypothesis. As when Consumer Price Index increases the export of textile and clothing decreases, and the p value is significant, and we cannot reject then null hypothesis. The tariff of Bangladesh and the tariff of partner countries have positive coefficient and p value is not that significant. So, we can reject the null hypothesis.

5.6 Hausman test

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
LNBDGDP	3.227895	3.278832	-.0509377	.1111163
LNPARTGDP	.5914586	.8203678	-.2289091	.407597
LAND_ENDOW~T	123.8655	-.5105995	124.3761	58.60884
LNCPI	-.9044755	-.7268125	-.177663	.162669
LNTARIFFBD	.0748344	.087293	-.0124585	.
LNTARIFPART	.186692	.1868322	-.0001402	.0401956

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 4.76
Prob>chi2 = 0.5745
(V_b-V_B is not positive definite)

Table 5: Hausman test

We did the Hausman test to select the best model between fixed effect model and random effect model. When P value is greater than 0.05 we can reject the null hypothesis and select the random effect model and when the p value is less than 0.05 we cannot reject the null hypothesis and select the fixed effect model. From our above table we can see that the p value of Hausman test is 0.57 which is greater than 0.05 so we can reject the null hypothesis and select the random effect model.

Section 6: Conclusion

This article's goal was to identify the factors and problems that influence Bangladesh's T&C exports. The trade gravity model was used to analyze the country-specific components of T&C trades between Bangladesh and its major 10 trading partners from 2000 to 2015. By establishing a theoretical basis for applying the gravity model in bilateral trade analysis, as well as to use the gravity model to analyze Bangladesh's export of textile and clothing with its key trading partners using the panel data estimate technique. We've established that using the gravity model in practical bilateral trade research is theoretically justified.

to explain the key factors influencing Bangladeshi garment exports. First, we discover that the significant determinants ln GDP of Bangladesh and ln GDP of Partner country show that developed nations trade more with Bangladesh. The geographical distance which did not affect the export of textile and clothing. Consumer Price index affects the export of textile and clothing industry. Tariff of Bangladesh and Partner nations has positive impact on the export of T&C.

After gaining its independence, Bangladesh's economy initially experienced negative development, but over time, by accelerating a number of factors, Bangladesh has experienced consistent growth. Bangladesh's GDP has increased fifty-fold since the country's

independence. Bangladesh is now ranked 39th in the world for greatest GDP. Bangladesh's GDP has grown by more than 6% over the past 20 years, with both exceptional acceleration and long-term consistent expansion. The growth of international remittance earnings, foreign reserves, ready-made clothing (RMG), foreign investment, privatization, etc. make this possible.

The textile and apparel industries are a major driver of growth in Bangladesh's quickly expanding economy. The primary sources of foreign exchange earnings are exports of clothes and textiles. In 2002, 77 percent of Bangladesh's total exports of goods were textiles, clothing, and ready-made garments (RMG). The World Bank assessed Bangladesh's GDP to be US$6.29 billion in 1972; it is projected to increase to $368 billion by 2021, with exports accounting for $46 billion of that total, of which 82 percent will come from ready-made clothing. After China, Bangladesh was the second-largest producer of clothing in 2016. After China, Bangladesh is the second-largest exporter of western fast fashion brands. Contracts for the export of western brands are made with European clients 60% of the time, Americans 30% of the time, and others 10% of the time. Just 5% of textile plants are owned by foreign investors; the rest are owned by local owners.

Implication and the limitation of the study

This work makes three contributions and has three implications. First of all, the information in the research is original. To run the OLS, FE, RE models in accordance with the theoretical advancements of the gravity model of trade, the I created a panel data set. Multicollinearity, heteroscedasticity, and serial correlation issues can be solved using panel data. Second, by employing the trade gravity model, the study closes a research gap on the factors that influence Bangladeshi textile and clothing production. Third, the current analysis is a distinctive piece of work in that the sample includes all of Bangladesh's major trading partners. For the industry to thrive and grow sustainably, it is crucial to enhance the working conditions of RMG employees. The Bangladeshi government might implement effective policy measures to address the moral and legal concerns with the T&C sector. Bangladesh's economy and foreign profits are largely dependent on the clothing sector.

I faced several limitations in the data collection, some of the data were missing and had to collect from different sites. Future studies may employ more scientific evidence to get better results and may also use Bangladesh's competitive advantages in the T&C sector globally. In the future, the gravity model could be used to analyze

the effects of a number of important governance indicators, including institutional quality, political stability, control of corruption, poor management, violence, and labor unrest.

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국 문 초 록

- 방글라데시 섬유 및 의류 수출 패널 데이터 분석: 중력 모델 접근 -

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라 시 드 마 문

이 논문의 목적은 수출에 영향을 미치는 요인을 파악하는 것입니다. 방글라데시의 섬유와 의류는 10개의 주요 무역 파트너와 함께 합니다. 섬유 및 의류. 연구를 분석하고 수행하기 위해 2000년부터 2015년까지 16년 동안 방글라데시 섬유 및 의류 수출의 패널 중력 모델을 총 10개 주요 무역 파트너에게 추정하기 위해 패널 데이터 세트를 생성했습니다. 회귀 분석, 고정 효과 모델, 랜덤 효과 모델 및 Hausman 테스트를 포함하여 고정 효과 모델과 랜덤 효과 모델 중에서 선택합니다. 본 연구의 종속변수는 섬유의류수출이며 독립변수는 방글라데시 GDP, 상대국 GDP, 지리적 거리, CPI(소비자물가지수), 토지 소유(방글라데시와 상대국의 총면적), 관세율이다. 방글라데시 및 파트너 국가의 관세율. 연구에 따르면 지리적 거리는 T&C(섬유 및 의류) 수출에 부정적

인 영향을 미치지 않지만 P 값은 매우 중요합니다. 토지 면적과 CPI는 음의 계수를 가지며 P 값은 매우 중요합니다. 한편 방글라데시 관세율과 상대국 관세율은 양의 계수를 나타내지만 P 값은 그다지 유의하지 않다. 이 연구는 방글라데시 T&C 산업 수출에 크게 기여했습니다. 그리고 이 연구는 더 많은 통찰력을 찾고 향후 추가 연구를 위한 새로운 길을 여는 데 도움이 될 것입니다.

키워드: 방글라데시, 섬유 및 의류, GDP, 회귀분석, 고정효과모형, 랜덤효과모형, 하우스만 테스트, 지리적 거리, CPI, 관세, 토지면적.