The Effect of the Pandemic on the RMG Export of Bangladesh: Exploring the Economic Channels of Transmission

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This study aims to empirically analyse the potential long-run and short-run effects of the COVID-19 pandemic on the ready-made garments (RMG) export growth of Bangladesh. We distinguish two transmission channels: credit growth and degree of openness to trade, through which the pandemic could affect the RMG export, using monthly time series data from June 2009 to August 2020. We employ a bounds test approach to the autoregressive distributed lag (ARDL) cointegration method. The bounds test specifies long-run and short-run relationships between credit growth, openness, and RMG exports. We found that the pandemic has a significant negative effect in the short run but a positive impact on export through these transmission channels in the long run. Thus, more credit support to this sector and opening up the economy for international trade is essential for the total recovery of the RMG export.

Key Words: ready-made garments (RMG), COVID-19 pandemic, export, Bangladesh
JEL Classification: I18, F14, L69

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Introduction

The RMG (ready-made garments) sector remains the key driver of the economic growth of Bangladesh. The sector is the largest source of export proceeds, foreign exchange reserve, and manufacturing and women's employment. The sector's contribution to the economy is almost 11.2% of the total GDP and accounts for 84% of the total export. The total market share of Bangladesh in the worldwide RMG export is approximately 6.5%, and the country continually secures the title of the second-largest exporter in RMG trading. The country aimed to increase the total apparel export by 2021, which is 8–10% of the global RMG trading and circa USD

50 billion of the export target (Akter 2020). Confronting all regional and global crises, the growth trend of RMG export is increasing.

However, the years 2020 and onwards have been critical for the RMG sector of Bangladesh. The COVID-19 pandemic and the shutdown of domestic and the European and North American markets caused enormous difficulty in maintaining this current growth pace and achieving the desired target of export growth. To minimize the unprecedented humanitarian devastation, the government declared a nationwide holiday and shut down all business and industrial activities for 62 days. Many international importers cancelled their confirmed buying orders ($3.16 billion worth) as their business units and retail outlets were closed, mainly in the EU, USA, Asia, and elsewhere due to the pandemic. The demand for Bangladeshi RMG products is 62% in EU markets alone, 21% in the USA and Canada, with the remaining portion in other countries (UNICEF 2020).

The adverse impact of COVID-19 is not limited to the RMG sector; its spillover effect has spread to other industries, consumers, and service sectors. A large number of backward linkage capital-intensive industries, such as yarn and fabric suppliers, have been affected gravely. Almost 425 yarn manufacturing, 796 fabric production, and 240 dyeing-printing-finishing enterprises and accessories suppliers such as hangers, zippers, bottoms, threads, and other small and medium enterprises (SMES) are directly connected in this RMG-value chain. In addition, 98% of the RMG companies are customers of commercial banks, almost all types of machinery and plants are insured through insurance companies, 87% of importers and 16% of exporters are clients of the insurance companies, and the government received 40% of the port usage fees from the RMG sector. The sector provides opportunities for the employment of approximately 4.1 million workers (UNICEF 2020). Thus, RMG is the crucial driver of other economic sectors, and the COVID-19 crisis in this sector has multiple chain-reactions on the whole economy. The recovery of the RMG sector is exceedingly crucial for the salvage of other sectors.

Though the pandemic is still continuing and it is unknown when it is going to end, determining the economic channel of the pandemic effect is essential for the quick recovery of RMG and the backward linkage industries. As of now, no empirical effort has been made to integrate the view that credit flows and openness to trade are important economic transmission channels for the COVID-19 effect on RMG export growth, particularly from the Bangladesh perspective. Thus, our main

aim is to investigate: (a) how credit flow and openness to trade determines export of RMG, (b) how the pandemic has affected the export performance through these two channels, and (c) whether there are long-run and short-run relationships between the COVID-19 pandemic and the RMG export growth of Bangladesh. In line with the research questions, we developed our hypotheses that more credit support and an open economy positively influence the export performance of Bangladesh, and that the ongoing pandemic may have an adverse effect on export growth of the RMG sector in the short-term but not in the long-term. To accomplish the objectives, this study employs the autoregressive distributed lag (ARDL) framework with an Error Correction Model (ECM) and bounds test of cointegration. The ARDL approach allows investigating the long-run and short-run relationships among variables. The study found that COVID-19 has a significant negative effect on export growth in the short run but not in the long run, which is conditional on more credit support and lessening of barriers of international trade.

The remainder of the paper is organized as follows. The second section explains the theoretical background and related literature. The third section elucidates the data and methodology. The fourth section illustrates the empirical results and discussion. Finally, the fifth section concludes the paper.

Theoretical Background and Empirical Literature Review

Several existing literatures have argued the issue of the impact of credit growth, openness, exchange rate, and money supply on export growth. Credit growth (extensively used as a proxy of financial development) is a crucial determinant of export performance. The theoretical relationship between credit growth and export performance was first introduced by Kletzer and Bardhan (1987). They found that countries with a relatively well-structured financial sector have a comparative advantage in industries and sectors that rely on external finance. Baldwin and Krugman (1989) and Ju and Wei (2005) also showed that financial development exogenously influences the trade performance of the economy, and thus credit growth can be considered a source of comparative advantage and has been examined from the viewpoint of economies of scale. A well-functioning financial sector channels more savings to the private sector, which facilitates companies to use external financing, and ultimately assists enterprises in surmounting liquidity constraints (Beck 2003; Svaleryd and Vlachos 2005). Rajan and Zingales (1998) underline

that credit growth helps enterprises to minimize the potential problem of moral hazard and adverse selection and to increase export growth using external financing. The role of credit flows on export has been recognized as a supply-side determinant. Berman and Héricourt (2010) use a firm-level panel dataset of developing countries and analyse the impact of financial development on export. They find that lack of credit flow adversely affects export growth and the total productivity of the firms. They conclude that more credit flow increases the number of exporters and hence overall export performance. Amiti and Weinstein (2011) and Manova (2013) also argue that more access to external finance sources encourages industries to export more. Susanto, Rosson, and Costa (2011) and Demir and Dahi (2011) point out that financial deepening positively affects bilateral trade performance, particularly in the export of the manufacturing sector, with relatively higher economies of scale. They also found that exports of developing countries depend more on financial deepening than those of developed countries. Goksel (2012) also found a negative correlation between financial constraints and export performance of a country. Since enterprises require more credit to cover their costs, financial deepening increases the country's export flow.

In addition, the degree of openness to trade is important for export growth. An open economic policy in trading with the outside world is required for export and economic growth. The impact of the degree of trade openness on export growth can be examined based on trade-growth theories. Ricardo (1817), using his concept of the 'win-win approach' or 'comparative advantage,' showed that international trade and specialization have mutually beneficial effects on countries who are actively engaged in trade. Trade openness improves output and consumption efficiency and increases the participating countries' welfare even if one country is more efficient. The empirical shreds of evidence of trade openness on export growth have produced mixed findings. A panel data study for ten Latin American countries and developing and least developed countries by Bleaney (1999) and Santos-Paulino (2002; 2007), respectively; time-series cointegration analysis for Bangladesh and Mexico by Ahmed (2000) and Pacheco-Lopez (2005), respectively; and World Bank papers (Michaely, Papageorgiou, and Choksi 1991; Thomas, Nash, and Edwards 1991; Joshi and Little 1996) for evaluation of the economic restructuring in India, all found that trade openness has a significant positive impact on export growth. Conversely, UNCTAD studies (Agosin 1991; Shafaeddin 1994), Greenaway and Sapsford (1994), and Ratnaike (2012) found no

positive or little adverse impact of trade openness on export. After the trade liberalization period, Dawson (2006) investigated the relationship between export, import, and income growth of Bangladesh. His finding reveals that trade openness raises export growth, but this impact is not significant in the long run.

Another important factor that significantly affects export growth is the exchange rate. An unstable exchange rate brings economic instability and uncertainty. The existing studies found mixed consequences of exchange rate instability on export growth. Chowdhury (1993), for example, discovered that changes in foreign exchange rates have a negative impact on international trade for G7 countries, using the error correction model. Arize, Osang, and Slottje (2000) also found that exchange rate fluctuation negatively affects the export levels of thirteen developing countries.

Hence, identification of the relationship between COVID-19 and export growth movements, particularly for the RMG sector of Bangladesh, is strongly required at the moment to initiate appropriate policy initiatives. The stakeholders, such as the government, investors, traders, and others, are keen to understand the underlying association between COVID-19 and export growth trends and the transmission channels through which the pandemic can affect them, so that the channels can be controlled to overcome the adverse impact of COVID-19 on export growth. This study is a piece of fresh evidence that investigates the economic transmission channels and the impact of COVID-19 on export movements.

Data and Methodology

EMPIRICAL SPECIFICATIONS

Based on previous studies, several macroeconomic factors such as credit growth, degree of openness to trade, exchange rate, and money supply (M2) could affect the RMG sector export growth. This study examines how the global COVID-19 pandemic can affect the sector through the channel of domestic credit and trade openness in Bangladesh. Moreover, export performance requires more credit flows and the openness of the domestic market to the global economy. The functional form of the long-run empirical model reflecting the effect of these above variables on RMG export can be specified as the following equation:

$$\mathrm{EXP}_{\mathrm{RMG}} = f(\mathrm{DC}_t, \mathrm{TO}_t, \mathrm{EXR}_t, \mathrm{M2}_t). \quad (1)$$

The transformed logarithmic equation of the function is:

$$\ln \text{EXP\_RMG}_t = \delta_0 + \delta_1 \ln \text{DC}_t + \delta_2 \ln \text{TO}_t + \delta_3 \ln \text{EXR}_t + \delta_4 \ln \text{M2}_t + \varepsilon_t, \quad (2)$$

where $\ln \text{EXP\_RMG}_t$ is the natural log of the merchandise export of RMG (including knitwear and hosiery) at month t (1 to 134); the log of total domestic credit to both public and private sector ($\ln \text{DC}_t$) is a proxy for credit growth; the log of the total merchandise export and import ($\ln \text{TO}_t$) is a proxy for openness to trade; $\ln \text{EXR}_t$ is the log of exchange rate (BDT against USD); $\ln \text{M2}_t$ refers to the money supply proxy by log of broad money; and ε_t is the error term.

We extend the analysis and identify that credit growth and trade openness are the two important channels of transmission through which the recent global pandemic (COVID-19) could affect the RMG export. Thus, we transformed Equation 2 into the following two equations:

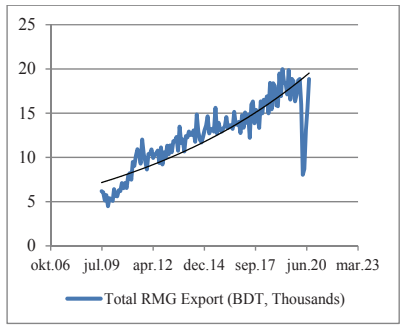
$$\ln \text{EXP\_RMG}_t = \delta_0 + \delta_1 \ln \text{DC}_t + \delta_2 \ln \text{TO}_t + \delta_3 \ln \text{EXR}_t + \delta_4 \ln \text{M2}_t + \gamma(\ln \text{DC} \times \text{COVID19})_t + \varepsilon_t \quad (3)$$

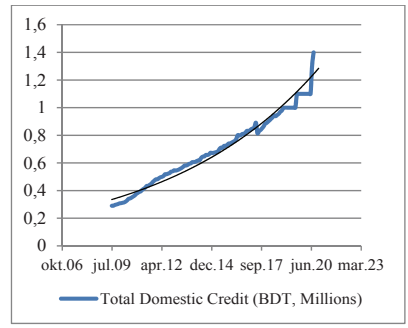
$$\ln \text{EXP\_RMG}_t = \delta_0 + \delta_1 \ln \text{DC}_t + \delta_2 \ln \text{TO}_t + \delta_3 \ln \text{EXR}_t + \delta_4 \ln \text{M2}_t + \varphi(\ln \text{TO} \times \text{COVID19})_t + \varepsilon_t. \quad (4)$$

COVID19 is the dummy variable taking the value 1 from the month when the virus was first found in Bangladesh and 0 otherwise. As per the World Health Organization, the first confirmed case of COVID-19 was found in Bangladesh in March 2020. The nationwide shutdown was enforced from March 26, 2020. We are expecting a positive sign for δ_1, δ_2, γ, and φ in the long-run and a negative sign for γ and φ in the short-run.

DATA AND STYLIZED FACTS

The monthly time series data used in this analysis covers the period July 2009–August 2020. The data on RMG export, domestic credit, trade openness, exchange rate, and money supply is collected from the Monthly Economic Trends data of Bangladesh Bank. The time series plot of RMG export, credit flows and openness to trade data are represented in figure 1. Export of RMG increased sharply until February 2020 but started dropping rapidly in March 2020 due to the confirmation of cases of COVID-19 in Bangladesh and various regions of the world, especially in European and North American countries. The subsequent two months experienced the lowest fall in RMG export. The growth of credit flow into the economy





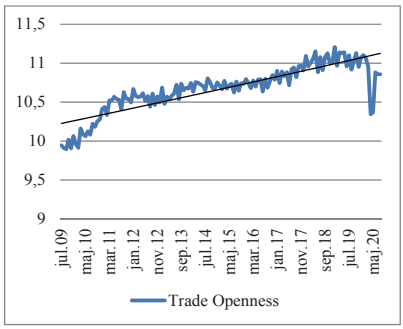


FIGURE 1

Time Series Illustration of RMG Export, Domestic Credit and Trade Openness Data

is also tending towards increase during the sample period. It was slightly stable from September 2019 to April 2020. The Government and Central Bank of Bangladesh announced several stimulus packages and lowered the policy rates and interest rate, which forces the flow of domestic credit in the economy after April 2020. Due to the shutdown of domestic industries and the lockdown of domestic and international borders, the degree of openness to trade shrinks from March 2020.

Figure 2 illustrates the early relationship of RMG export with credit flow and openness to trade. We plot RMG export in the vertical axis of each graph. The correlation of domestic credit and openness with export is strongly positive, signifying that both the explanatory variable have a favourable effect on Bangladesh's RMG export. That is, an increase of domestic credit (degree of openness to trade) leads to an increase in export of the RMG sector. Thus our initial hypothesis is that credit growth and trade openness have a positive effect on RMG export both in the long run and short run in the economy of Bangladesh. The short-run effect of COVID-19 through these two channels is negative. But the long-run effect of COVID-19 is positive. We empirically analyse these two hypotheses using important control variables in the results and discussion section.

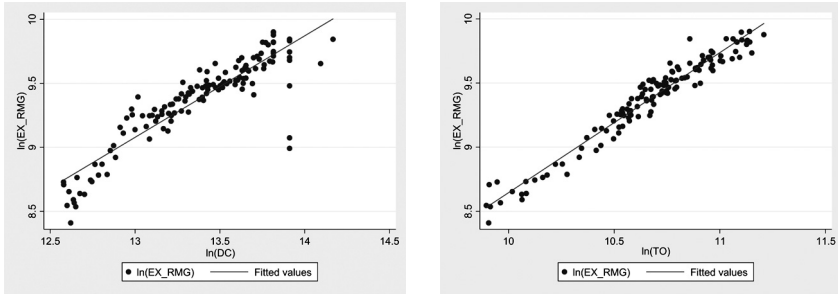


FIGURE 2 Stylized Facts

ESTIMATION STRATEGY

This study employed several relevant estimation strategies to examine the impact of credit growth, openness to trade, and the COVID-19 pandemic on RMG export flow. For examining the long-run effects of each explanatory and control variable on export, the ARDL cointegration framework developed by Pesaran and Shin (1995; 1999), Pesaran, Shin, and Smith (1996), and Pesaran (1997) is an appropriate and extensively used model. This framework has several advantages compared to other conventional cointegration frameworks such as Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990). First, while Johansen's cointegration framework requires that all sampled variables must have an identical order of integration, the ARDL cointegration approach can be applied when the order of integration is mixed (Shrestha and Bhatta 2018). The ARDL model allows both different and equal numbers of lag length order for the corresponding variables without affecting the asymptotic distribution of the test statistic (Pesaran, Shin, and Smith 1996). When the variables are integrated at I(0), at (I), or jointly cointegrated, ARDL cointegration yields effective and valid coefficients while the Johansen cointegration approach requires all the variables to be I(1) (Pesaran, Shin, and Smith 1996). Second, the model allows autocorrelation and endogeneity and yields valid *t*-statistics and unbiased estimates (Harris and Sollis 2003). Third, the ARDL error correction model (ECM) allows us to determine short-run estimates without losing valid long-run estimates obtained from the ARDL cointegration test. Fourth, the conventional cointegration framework determines the long-run correlation within the context of a system of equations; the ARDL approach allows only a single reduced form equation (Pesaran and Shin 1995).

Estimating a long-run relationship follows a two-step procedure: first, employing the ARDL bounds test to confirm the existence of a long-run

relationship of Equations 2 to 4; and second, estimating the long-run estimates of long-run relationships found in the bounds test. Following our baseline equations (2 to 4), we execute the following conditional error correction (EC) models of the ARDL cointegration approach:

$$\begin{aligned}\Delta \ln \text{EXP\_RMG}_t = {} & \delta_0 + \sum_{i=1}^{d} \sigma_i \Delta \ln \text{EXP\_RMG}_{t-i} + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{DC}_{t-i} \\ & + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{TO}_{t-i} + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{EXR}_{t-i} \\ & + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{M2}_{t-i} + \alpha \ln \text{EXP\_RMG}_{t-1} \\ & + \delta_1 \ln \text{DC}_{t-1} + \delta_2 \ln \text{TO}_{t-1} + \delta_3 \ln \text{EXR}_{t-1} \\ & + \delta_4 \ln \text{M2}_{t-1} + \varepsilon_t \end{aligned} \tag{5}$$

$$\begin{aligned}\Delta \ln \text{EXP\_RMG}_t = {} & \delta_0 + \sum_{i=1}^{d} \sigma_i \Delta \ln \text{EXP\_RMG}_{t-i} + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{DC}_{t-i} \\ & + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{TO}_{t-i} + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{EXR}_{t-i} \\ & + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{M2}_{t-i} + \sum_{i=0}^{d} \sigma_i \Delta (\ln \text{DC} \times \text{COVID19})_{t-1} \\ & + \alpha \ln \text{EXP\_RMG}_{t-1} + \delta_1 \ln \text{DC}_{t-1} + \delta_2 \ln \text{TO}_{t-1} \\ & + \delta_3 \ln \text{EXR}_{t-1} + \delta_4 \ln \text{M2}_{t-1} \\ & + \gamma (\ln \text{DC} \times \text{COVID19})_{t-1} + \varepsilon_t \end{aligned} \tag{6}$$

$$\begin{aligned}\Delta \ln \text{EXP\_RMG}_t = {} & \delta_0 + \sum_{i=1}^{d} \sigma_i \Delta \ln \text{EXP\_RMG}_{t-i} + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{DC}_{t-i} \\ & + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{TO}_{t-i} + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{EXR}_{t-i} \\ & + \sum_{i=0}^{d} \sigma_i \Delta \ln \text{M2}_{t-i} + \sum_{i=0}^{d} \sigma_i \Delta (\ln \text{DC} \times \text{COVID19})_{t-1} \\ & + \alpha \ln \text{EXP\_RMG}_{t-1} + \delta_1 \ln \text{DC}_{t-1} + \delta_2 \ln \text{TO}_{t-1} \\ & + \delta_3 \ln \text{EXR}_{t-1} + \delta_4 \ln \text{M2}_{t-1} \\ & + \varphi (\ln \text{TO} \times \text{COVID19})_{t-1} + \varepsilon_t \end{aligned} \tag{7}$$

where Δ refers to the first difference of the variables and d denotes the length of optimal lag. δ_1, δ_2, δ_3, δ_4, γ and φ are the long-run coefficients.

We consider the Schwarz Bayesian information criterion (SBIC) to determine the optimal lag length. The F-statistic of the Pesaran, Shin, and Smith (2001) ARDL bounds test is used to determine the long-run relationship and whether there exists cointegration among the variables or not. The null hypothesis (H0) of the test is there exists no relationship in levels, that is, $\alpha = \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$, $\alpha = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \gamma = 0$ and $\alpha = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \varphi = 0$ for Equations 5, 6 and 7, respectively. The F-test statistics depend on various predetermined conditions such as the order of integration among variables should be I(0), I(1) or a mix of both, the number of independent variables, and whether the models hold intercept and/or trend. The bounds test provides two critical values. The critical values of I(0) order are called lower bound critical values and critical values of I(1) order of integration are referred to as upper bound critical values. When the F-statistics of the bounds test exceeds the respective upper critical values, we then can conclude that there exists a long-run relationship between the variables irrespective of the integration order of the variables.

Empirical Results and Discussion

SUMMARY STATISTICS AND CORRELATION MATRIX

Table 1 and table 2 illustrate the descriptive statistics and correlation matrix of the variables used in this analysis. The correlation matrix shows that the coefficient of correlation between the main explanatory variables and control variables, except M2, is positive. Though the correlation of DC, TO, and EXR is large, the variance inflation factor (VIF) test of the

TABLE 1 Summary Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
EXP_RMG	134	9.37818	0.34243	8.40938	9.90198
DC	134	13.37826	0.38868	12.57824	14.16684
TO	134	10.67142	0.30563	9.89465	11.20808
EXR	134	4.36554	0.05705	4.23999	4.44206
M2	134	6.99970	4.93707	−0.64000	22.44000
DC × COVID19	134	0.62615	2.90299	0	14.16684
TO × COVID19	134	0.47963	2.22425	0	10.95643

TABLE 2 Correlation Matrix of Variables

	EXP_RMG	DC	TO	EXR	M2	DC × C	TO × C
EXP_RMG	1						
DC	0.9003	1					
TO	0.9746	0.8885	1				
EXR	0.7999	0.8684	0.8167	1			
M2	−0.3537	−0.3231	−0.3241	−0.2160	1		
DC × C	0.0191	0.3158	−0.0049	0.2630	0.1539	1	
TO × C	0.0219	0.3161	−0.0019	0.2629	0.1550	0.9998	1

NOTES C stands for COVID19.

TABLE 3 Variance Inflation Factor (VIF) test

Variable	Equation 2		Equation 3		Equation 4	
	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
DC	7.10	0.140753	10.53	0.095009	10.39	0.096275
TO	5.24	0.190690	8.41	0.118839	8.25	0.121160
EXR	4.29	0.233356	4.36	0.229219	4.36	0.229466
M2	1.15	0.868052	1.23	0.814272	1.23	0.814615
DC × COVID			1.89	0.528526		
TO × COVID					1.86	0.538802
Mean VIF	4.45		5.28		5.22	

regressed results is only 5.46 (see table 3), within the range 10, indicating that multicollinearity is not a problematic issue in our analysis. The total number of observations is 134.

UNIT ROOT TEST

In order to employ the autoregressive distributed lag (ARDL) bounds test approach, we used the Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) tests to check the stationarity and order of integration of the variables first.

The main assumption of the ARDL bounds test is that the order of integration should be either I(0) or I(1). For I(2), the ARDL bounds test findings could be biased (Pesaran and Shin 1998). Table 4 illustrates the results of the unit root tests. According to the ADF test, only two variables, openness (TO) and broad money (M2), are both stationary at the level, and all other variables are stationary at first difference. The PP test

TABLE 4 Findings from Unit Root Tests

Variables	ADF Test		PP Test	
	I(0)	I(1)	I(0)	I(1)
EXP_RMG	−2.013	−9.721***	−2.211	−16.555***
DC	−0.487	−5.526***	−0.428	−9.962***
TO	−2.590*	−11.955***	−2.763*	−19.014***
EXR	−1.844	−8.464***	−1.819	−10.424***
M2	−5.275***	−10.065***	−6.025***	−14.248***
DC × COVID19	−0.073	−8.096***	−0.094	−11.491***
TO × COVID19	−0.118	−12.150***	0.127	−11.470***

NOTES Test statistics ($z(t)$ value) are reported. ** and *** is the significance level at 5% and 1%, respectively.

also shows identical results to the ADF test. Therefore, variables TO and M2 are integrated at I(O), and Export, EXR, and Dummy interactions are integrated at I(1). Variables fit at I(0) and I(1), indicating that the ARDL bounds test approach is suitable for our analysis.

OPTIMAL LAG SELECTION

The selection of the optimal lag length is crucial before employing the ARDL bounds test. Inappropriate lag lengths lessen the model reliability and lead to biased estimation results. We consider the Schwarz-Bayesian information criterion (SBIC) to select the optimal lag length of each variable.

Table 5 illustrates the SBIC test findings. It shows that DC, EXR, M2, DC COVID19, and TO COVID19 are significant at first lag; EXP_RMG is significant at second lag, and TO is significant at a third lag. Thus, the SBIC recommends using a maximum of 3 lags.

TABLE 5 Selection of Optimal Lag: Schwarz-Bayesian Information Criterion (SBIC)

Lag	EXP_RMG	DC	TO	EXR	M2	DC × C	TO × C
0	0.6061	0.8723	0.3320	5.7410	6.0701	4.8560	4.3121
1	−1.1405	−4.7534*	−1.2216	2.4450*	5.7320*	3.3027*	2.7122*
2	−1.2221*	−4.7263	−1.3875	2.4714	5.7697	3.3401	2.7495
3	−1.1861	−4.6899	−1.3923*	2.4981	5.8040	3.3775	2.7852
4	−1.1972	−4.6540	−1.3914	2.5064	5.8373	3.4149	2.8227

NOTES C stands for COVID19. * is the significance level at 10%.

TABLE 6 ARDL Bounds Test for Long-Run Cointegration

Equation	*F*-Statistic	SBIC lag length crit.	Bounds crit. val.		Remarks
			I(0)	I(1)	
5	11.363	(1, 0, 1, 0, 3)	3.74	5.06	Long-run cointegration exists
6	14.155	(1, 1, 2, 0, 3, 3)	3.41	4.68	Long-run cointegration exists
7	14.076	(1, 1, 2, 0, 3, 3)	3.41	4.68	Long-run cointegration exists

LONG-RUN COINTEGRATION TEST

To determine the existence of the long-run cointegration among the variables, we employ the ARDL bounds test. Table 6 represents the summary findings of the bounds test. The null hypothesis (H0) of the test is $\alpha = 0$. As the *F*-statistic of each ARDL bounds test is higher than I(1) (upper bound), we can reject the null and conclude that there exists a long-run cointegration relationship (in all three cases) among the variables.

LONG-RUN AND SHORT-RUN EQUILIBRIUM RELATIONSHIP

Table 7 reports the long-run coefficient for the three models. Except for EXR, the sign of all long-run coefficients is positive and statistically significant, at least at the 5% level. The coefficient of EXR is negative but insignificant in all models. The results illustrate that DC, TO, and M2 have a significant positive relationship with the export of the RMG sector. Initially (column 1), the long-run elasticities for DC, TO, and M2 are 0.171, 1.070, and 0.0126, respectively, meaning a 1% increase of DC, TO, and TO will lead to an increase of 0.0126%, 1.070%, and 0.0126% in RMG exports, separately. Consequently, the findings support the hypothesis that the level of domestic credit and trade openness is a good forecaster of the country's successive level of export. More credit flow to the economy helps develop the financial sector that improves the lender's and borrower's safety in having available funds and efficient transfer of the funds from one hand to another. A sound financial sector helps enhance investment (both domestic and foreign) that expands the enterprises' productivity, to manufacture more products for exports. In other words, an economy with a well-developed financial system encourages higher export (Beck 2003; Kiendrebeogo 2012). The coefficients of the exchange rate illustrate that a 1% increase in the exchange rate leads to a decrease

TABLE 7 Long Run Relationship

Variables	(1)	(2)	(3)
DC	0.1710**	0.2370**	0.2370**
	(0.0707)	(0.0979)	(0.0979)
TO	1.0700***	0.9690***	0.9690***
	(0.0841)	(0.1270)	(0.1270)
EXR	−0.0055	−0.0052	−0.0052
	(0.0044)	(0.0042)	(0.0042)
M2	0.0126***	0.0135***	0.0135***
	(0.0036)	(0.0034)	(0.0034)
DC × COVID19		0.0376**	
		(0.0151)	
TO × COVID19			0.0511**
			(0.0202)
Observations	130	130	130
R-squared	0.867	0.898	0.898

NOTES The results of columns (1), (2), and (3) are obtained from Equations (5), (6), and (7), respectively. Standard errors in parentheses. ** and *** is the significance level at 5% and 1%, respectively.

in export by 0.005%. This is because an appreciation in the exchange rate makes imported goods and services relatively inexpensive, while depreciation makes exports become cheaper for international buyers, thus intensifying higher export competition in the domestic market. However, the negative effect of the exchange rate on export is supported by existing studies such as Vergil (2002). The long-run coefficients of the money supply are found to be positive. These findings are also suitable for the theories because when the supply of money increases in the economy, the value of the Bangladeshi Taka will decrease and thus enhance the country's export.

We introduce two interaction variables, DC × COVID19 and TO × COVID19, in order to measure the effect of COVID-19 on RMG exports. We find that COVID-19 has no negative effect on RMG export of Bangladesh through DC and TO channels in the long run. The interaction effect of COVID-19 through the domestic credit channel and openness of the economy increases the positive effect of DC and M2 but slightly decreases the positive effect of TO (Columns 2 and 3). The long-run positive effect of COVID-19 on RMG export through domestic credit channels is

expected and theoretically plausible. To combat the crisis and quick recovery of the RMG sector, the Bangladesh government and central bank have taken instant initiatives and announced 19 stimulus packages totalling 3.7% of the country's GDP. The packages include (a) packages for export-oriented industries at only a 2% interest rate a total of BDT 50 billion to pay the workers' wage bill; (b) BDT 300 billion for banks and financial institutions to make available working capital financing facilities at a 9% interest rate to the COVID-affected industries where the government will bear half of the interest amount as a subsidy; (c) BDT 200 billion for working capital loans to cottage, small and medium enterprises through banks at the above rate where the government will bear 5% of the interest rate as a subsidy and the remaining 4% will be borne by the borrower; (d) a BDT 50 billion refinance scheme for the agricultural sector with a six-month grace period and a 5% interest rate (1% interest charged on banks and 4% from the borrowers); (e) extension of the export development fund to USD 50 billion from USD 3.5 billion under the Back-to-Back letter of credit arrangement at only a 2% interest rate; and (f) a pre-shipment credit refinance scheme of BDT 50 billion for domestic products and export-oriented sectors. Moreover, the measures include a single-digit interest rate, lowering of the reserve requirement ratio and bank rate, and several stimulus packages for cottage, micro, small and medium enterprises. Monetary measures to increase the credit flow into the economy are already in effect. In addition, many countries in Europe and North America have already relaxed lockdown decisions and opened their economy for the outer world, which makes enough of a fortune for the quick recovery of the RMG sector export of Bangladesh.

Table 8 presents the findings of the short-run dynamic estimates from the ECM models. In all three cases, the error correction term (ECT_{t-1}) estimates are significant at a 1% significance level with the negative impact between 0 and negative 1, suggesting that each model can promptly converge back to long-run equilibrium after a short-run shock. The value of −0.47 signifies that the imbalance from the shock of the current period can be controlled in the next period by about 47%. It means that any disequilibrium of RMG export flow would converge back within two months. All models satisfy the fundamental diagnostic test requirements, such as heteroscedasticity, the normality of the residues, and serial correlation.

Table 8 provides the short-run coefficients of the variables. In the initial model (Equation 5), we do not find any impact of credit growth and exchange rate in the short run. Thus, the credit flow to the economy and

TABLE 8 Short Run Relationship

Variables	(1)	(2)	(3)
ΔDC		−0.6710**	−0.6710**
		(0.3120)	(0.3120)
ΔTO	0.4450***	0.3410***	0.3410***
	(0.0819)	(0.0892)	(0.0892)
ΔTO_{t-1}		−0.1530***	−0.1530***
		(0.0541)	(0.0541)
ΔM2	−0.0063***	−0.0054***	−0.0054***
	(0.0014)	(0.0014)	(0.0014)
$\Delta M2_{t-1}$	−0.0049***	−0.0049***	−0.0049***
	(0.0013)	(0.0012)	(0.0012)
$\Delta M2_{t-2}$	−0.0028**	−0.0032***	−0.0032***
	(0.0012)	(0.0011)	(0.0011)
Δ(DC × COVID19)		−0.0365***	
		(0.0076)	
$\Delta(DC \times COVID19)_{t-1}$		−0.0272***	
		(0.0074)	
$\Delta(DC \times COVID19)_{t-2}$		−0.0235***	
		(0.0063)	
Δ(TO × COVID19)			−0.0493***
			(0.0103)
$\Delta(TO \times COVID19)_{t-1}$			−0.0367***
			(0.0101)
$\Delta(TO \times COVID19)_{t-2}$			−0.0306***
			(0.0086)
ECM_{t-1}	−0.4742***	−0.4794***	−0.4794***
	(0.0724)	(0.0698)	(0.0698)
Constant	−1.8910***	−1.8190***	−1.8190***
	(0.3280)	(0.3170)	(0.3170)

Continued on the next page

the exchange rate affect RMG export only in the long run but not in the short run. Considering the interaction term in Equation 6 and Equation 7, we find a negative effect of credit on RMG export growth. The findings are statistically significant at the 5% level. In the short run, the changes in

TABLE 8 *Continued from the previous page*

Variables	(1)	(2)	(3)
Observations	130	130	130
R-squared	0.8670	0.8980	0.8980
Durbin-Watson *d*-statistic	2.0249	2.1192	2.1192
Breusch-Godfrey LM test (*p*-value)	0.5964	0.2407	0.2407
White's test (*p*-value)	0.0933	0.4457	0.4457
Jarque-Bera normality test	0.4986	0.4954	0.4954

NOTES The results of columns (1), (2), and (3) are obtained from Equations (5), (6), and (7), respectively. Standard errors in parentheses. ** and *** is the significance level at 5% and 1%, respectively.

the degree of openness to trade enhance export but, due to the COVID-19 effect, with one period lag, the changes of TO reduce the RMG exports. In all three cases, the changes in M2 have a negative effect on RMG export in the short run. Our main coefficient of interest is the interaction term, DC × COVID19 and TO × COVID19. The impact of the pandemic through DC and TO channels on RMG export growth is negative and statistically significant at a 1% level in all cases in the short run.

MODEL STABILITY TESTING

The misspecification of the functional form of the ARDL-ECM models may arise due to the volatility of the time variable. To confirm the stability of the models, we employ the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) tests (Pesaran and Pesaran 1995). The CUSUM and CUSUMSQ tests statistics are measured as the cumulative sum and the cumulative sum of the estimates' squares are supposed to be stable (Brown, Durbin, and Evans 1975). As per figure 3, the CUSUM and CUSUMSQ plots lie between the critical lower and upper bounds (red lines) at the 5% significance level. Thus, the selected models are statistically stable, and the estimates of DC, TO, EXR, M2 to EXP_RMG, and coefficients corresponding to DC, TO, EXR, M2 to EXP_RMG are reliable.

Conclusion

This study empirically analysed the potential long-run and short-run effects of the COVID-19 pandemic through credit flow and openness of trade channels on RMG export growth of the Bangladesh economy over the period from July 2009 to August 2020. Using the ARDL-bounds test

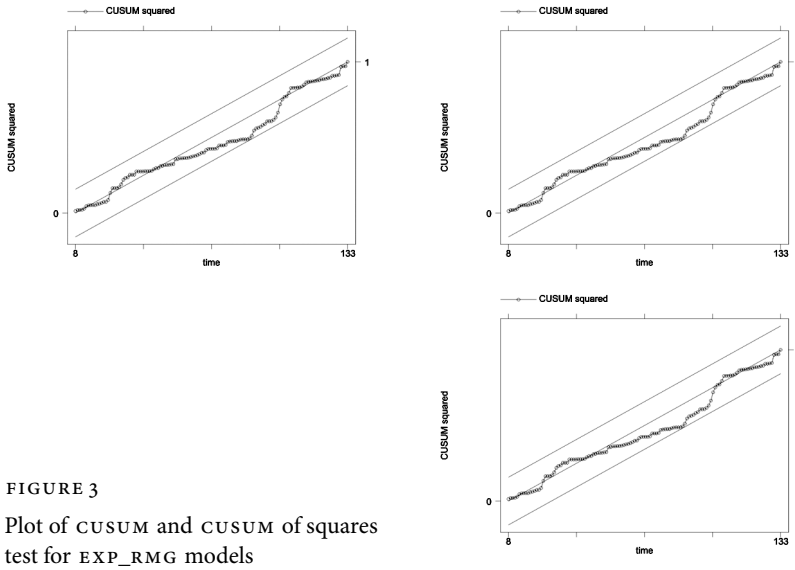


FIGURE 3

Plot of CUSUM and CUSUM of squares test for EXP_RMG models

and ECM approaches, the study primarily revealed that credit flow and openness to trade has a substantial impact on the RMG export growth of Bangladesh. The opening of the domestic economy for international trade has had a positive and significant impact on the RMG export growth of the country. At the same time, the positive effect of domestic credit support on RMG export is found only in the long run. In the short run, the effect of COVID-19 is negative and statistically significant, but in the long-run, the effect is highly significant and positive for the export of RMG. The negative effect in the short run and positive effect in the long run is theoretically plausible because injecting credit into this sector would not affect it within the shortest possible time. Higher credit to this sector and more trade activities will minimize the negative effect of COVID-19 on the export of the RMG sector. Thus, in order to alleviate the impeding export crisis of the RMG sector, emergency financial assistance and reduction of trade obstacles are required for the recovery of the sector. Assistance to this sector would be the largest contributor to poverty alleviation, women's empowerment, normalizing the supply chain management of the economy significantly, and achieve this faster.

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