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THE MODERATING ROLE OF LABOUR PRODUCTIVITY BETWEEN READYMADE GARMENT EXPORTS AND ECONOMIC GROWTH IN BANGLADESH

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Abstract:

This study investigates the moderating role of labour productivity on the relationship between readymade exports and economic growth in Bangladesh using annual time series data from 1983 to 2019 using the ARDL method. This study examines the moderating impact of labour productivity on the link between readymade garment (RMG) exports and economic growth in Bangladesh taking time series data from the year 1983 to 2019 using the ARDL model. The most important factor that is impacting the competitiveness of Bangladesh's RMG industry is poor labour productivity trends. A long-run positive relationship between RMG exports, labour productivity, and economic growth is observed. The RMG export earnings are significantly improving the economic growth of the country both in the long and short run. The policy implication is improving labour skills, providing training, and the use of information technology in the RMG sector will promote economic growth.

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INTRODUCTION

International trade is playing a very crucial role in improving the economic growth of a country. The export-led growth hypothesis is one of the most highlighted strategies of policymakers. Comparably, an export-led growth strategy is more important to developing countries which may help to earn from export and use to dynamic benefits of the nation. The significance of continuing productivity growth in the existing literature is already established to survive the market competition. Also, labour productivity growth fully correlates with economic growth. Theoretically and practically, therefore, the study of labour productivity is important to define productivity as a physical input quantity and production of volume (Mark, 1971).

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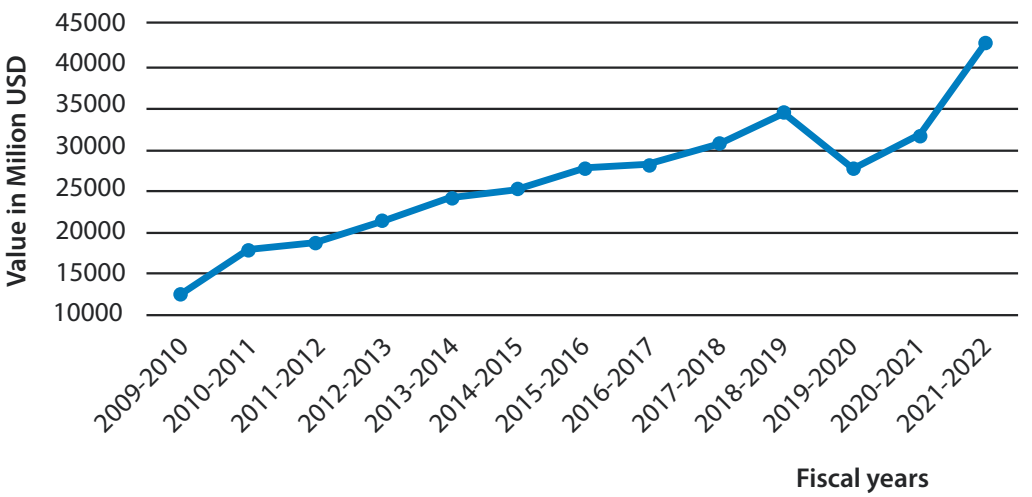
Numerous authors have emphasized how crucial labour productivity is to retain the competitiveness of the world manufacturing industry (Ma, Liu, & Mills, 2016; Palel, Ismail, & Awang, 2016). High labour productivity in the manufacturing industry helps a nation to thrive sustainably and economically. In addition, it is theoretically proved that there is a significant impact of export on economic growth (Temiz *et al.* 2019; Abdullah *et al* 2017; Datta *et al.* 2018; Adebayo, 2020; Nguyen *et al.* 2021; Kalita & Sahariah, 2021).

Bangladesh is A South Asian country; Bangladesh's economy is expanding rapidly. The core of Bangladesh's economy is the ready-made-garment (RMG) sector. Bangladesh is the second biggest exporter of RMG after China. Bangladesh's economy is an export-based country and 80% of its export earnings is coming from a single industry which is the readymade garment (RMG) sector. Despite this, the RMG industry faces so many issues and difficulties to grow. In fiscal year 2021-22 the total value of the RMG export by Bangladesh was 42.61 billion USD which is around 81.82% of the country's national export (BGMEA, 2023). Figure 1 shows that the growth rate in the gross domestic product (GDP), and RMG exports in Bangladesh also increased continuously since 1990.

Figure 1. Ready-made garment Export (US$) in Bangladesh



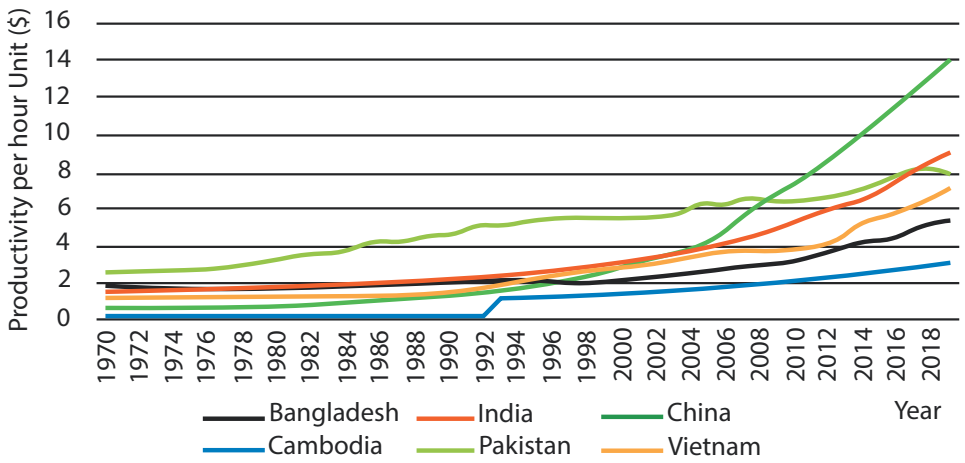
Source: *BGMEA (2023)*

Bangladesh RMG industry is facing heavy competition with other exporters such as Vietnam, India, Cambodia, and Indonesia. One of the biggest drawbacks to growing the RMG industry is low labour productivity. The per-hour workers' productivity in Bangladesh is lower than the other RMG exporting countries (Asian Productivity Organization, 2018). Some studies, including Saxena and Salze-Lozac'h (2017) has indicated that one of the biggest weaknesses in Bangladesh's garment industry is low labour productivity. The productivity of Bangladesh's labour is considered to be lower than other RMG exporters namely China, India, and Vietnam (Figure 2).

Labour productivity is strongly related to the competitiveness issues of the country. The use of an unskilled workforce by the RMG industry contributes to low productivity and comparatively costly production. In the case of minimum labour wage rate, Bangladesh has been able to achieve the commendable rate, but the productivity per hour worker rate is very low in comparison to other RMG exporters. This captures a lot of attention to understand the reason behind the low productivity rate in the RMG

industry, which will eventually impact the economic growth of the country. Most factories do not have on-site training facilities and these have, and there are currently poor quality training facilities due to the lack of professionally qualified trainers, poor training programs, lack of training assistances, no systemic evaluation, and evaluation training needs programs, no follow-up and feedback interventions, no corollary relationship as well as no monitoring. Thus, the number of unskilled labours in garment factories results in a lower productivity score compared to China, India, and Vietnam.

Figure 2. The labour productivity per hour by RMG exporters



Source: *The Conference Board Total Economy Database, 2019.*

It is widely acknowledged the importance of continuous improvement in productivity for sustainable economic growth. Therefore, this study aims to investigate the role of labour productivity on the relationship between RMG export and economic growth in Bangladesh. This study contributes to the literature by investigating the impact of RMG exports on economic growth through channelling labour productivity.

The reminder paper is structured as follows; section 2 discusses the methodology and empirical models, section 3 describes the empirical results and discussion, and section 4 the study conclusion and policy implications.

LITERATURE REVIEW

In literature, some studies are also available regarding the impact of RMG exports on Bangladesh's economic growth. For example, Mandle (2013); Islam *et al.* (2016); Islam (2020); Mirdha (2018); Shimu & Islam (2018). But a major variable such as labour productivity, which is closely linked to RMG industry growth, is not examined. This study is therefore aimed at filling this gap and addressing the impact of labour productivity on the relationship between RMG exports and the country's economic growth. The economic growth theory suggests that one of the key drivers of economic growth was export income. It states that the entire economy may speed up the growth rate by increasing export income. However, in the literature, the export-led growth hypothesis does not always have positive effects on developing countries. The reason behind this scenario is developing countries are mainly dependent

on primary their primary commodity exports and those manufacturing sectors are required many external; factors for sustainable growth (Ee, 2016). Mandle (2013) mentioned that, with its labour-intensive production methods and enormous job opportunities for a large population with limited human capital, the Bangladesh-based RMG industry had obvious comparative advantages. However, given that wage structures and income levels in the industry are low, more productive sectors should complement the RMG sector to achieve progress in living conditions.

Bangladesh is a comparatively low-cost location for labour, which played a crucial part in the expansion and success of the RMG sector. Despite extensive research into the contribution of the RMG sector to the economy of Bangladesh the specific literature on RMG export earnings and the connection between economic growth is generally lacking. Low-cost rural employees are easily drawn in the RMG sector partly because of the availability of the labour supply. Likewise, Tang (2020) examined that exports earnings is responsible for the economic growth in Central and Eastern Europe. A study by Syed and Mahmud (2022) found that increased wage rate and other policies related to the improvement of workers have a significant impact on the workers' satisfaction which ultimately increase their productivity. Similarly, Sadovsky and Matějkova (2019) that increasing the minimum wage is unrelated to the growth of the economy. They consider doing rid of the guaranteed salary to be a sensible reaction to the circumstances and the needs of the economy. The authors' strategy, meanwhile, might not be relevant in Bangladesh.

However, given that wage structures and income levels in the industry are low, more productive sectors should complement the RMG sector to achieve progress in living conditions. Various studies are dealing with the problem of labour disturbances (Khan and Rodrigues, 2015), and several articles criticized the low pay and poor living circumstances of RMG workers. (Hossain *et al*. 2010). There are several research studies on RMG workers' low-standard living conditions and the challenges facing the RMG sector in Bangladesh (Hossain *et al*. 2010; Hasan 2013; Schwab 2014; Islam *et al*. 2016). Dhiman and Sharma (2019) examine the effects of labour productivity on the Indian textile industry's ability to compete internationally utilizing time series data. The study result reveals that there is no long-run or short-run causality between labour productivity and export competitiveness.

METHODOLOGY

Empirical models

We explore the role of labour-productivity on the export-economic growth relationship focusing on RMG export in Bangladesh, adopting models based on previous studies of Zulu and Banda (2015), and Islam (2020). The baseline equation is written as:

$$GDP_t = a_0 + a_1 EX_t + a_2 LP_t + a_3 POP_t + a_4 FDI_t + a_5 PC_t + a_6 HCI_t + a_7 INN_t + a_9 \left(EX_t * LP_t\right) + \mu_t \quad (1)$$

Whereby:

t = *Annual* time series for the period from 1983-2019

GDP_t = Real Gross domestic product per capita (current US$)

EX_t = Readymade garment export (current US$)

LP_t = *Growth* of Labour Productivity per hour worked (% change)
POP_t = Population growth (%)
FDI_t = Foreign direct investment, net inflows (% of GDP)
PC_t = Physical capital (Gross capital formation% of GDP)
HCI_t = Human capital Index
INN_t = Innovation (Total patent application)
μ_t = Error term

α_0 is the intercept term and α_1, α_2, α_3, α_4, α_5, and α_6 are the respective coefficient of the variables. To obtain more robust results, we investigate the interaction variable in separate models. Model (2) is the basic growth model, model (3) includes the LPt variable and other control variables, model (3) shows the interaction variable (EX_t*LP_t). The dependent variable is GDP_t and the right side variables as independent variables are as follows:

$$GDP_t = a_0 + a_1 GDP_{t-i} + a_2 EX_t + a_3 POP_t + a_4 PC_t + a_5 HCI_t + a_6 INN_t + \mu_t \quad (2)$$

$$GDP_t = a_0 + a_1 GDP_{t-i} + a_2 EX_t + a_3 LP_t + a_4 POP_t + a_5 FDI_t + a_6 PC_t + a_7 HCI_t + a_8 INN_t + \mu_t \quad (3)$$

$$\begin{aligned} GDP_t = {} & a_0 + a_1 GDP_{t-i} + a_2 FDI_t + a_3 POP_t + a_4 FDI_t + a_5 PC_t + a_6 HCI_t + a_7 INN_t \\ & + a_8 \left(EX_t * LP_t \right) + \mu_t \end{aligned} \quad (4)$$

The present investigation is carried out using Pesaran *et al.* (2001)'s ARDL bound testing approach for examining both long and short-run relationships between these variables. The advantage of the ARDL method is variables do not require the same integration order. It is a useful approach for the co-integration analysis in a small sample size that allows various optimal variable lags. By taking into account the variables long-term relationships, equations (1), (2), and (3) are re-written as equations (5), (6), and (7):

$$\begin{aligned} \Delta GDP_t = {} & a_0 + \beta_0 GDP_{t-i} + \beta_1 EX_{t-i} + \beta_2 POP_{t-i} + \beta_3 PC_{t-i} + \beta_4 HCI_{t-i} + \beta_5 INN_{t-i} + \sum_{i=1}^{r} \varphi_i \Delta GDP_{t-i} \\ & + \sum_{i=1}^{r} \pi_i \Delta EX_{t-i} + \sum_{i=1}^{r} \tau_i \Delta POP_{t-i} + \sum_{i=1}^{r} \gamma_i \Delta PC_{t-i} + \sum_{i=1}^{r} \Omega_i \Delta HCI_{t-i} + \sum_{i=1}^{r} \in_i \Delta INN_{t-i} + \mu_t \end{aligned} \quad (5)$$

$$\begin{aligned} \Delta GDP_t = {} & a_0 + \beta_0 GDP_{t-i} + \beta_1 LP_{t-i} + \beta_2 POP_{t-i} + \beta_3 FDI_{t-i} + \beta_4 PC_{t-i} + \beta_5 HCI_{t-i} + \beta_6 INN_{t-i} \\ & + \sum_{i=1}^{r} \varphi_i \Delta GDP_{t-i} + \sum_{i=1}^{r} \pi_i \Delta LP_{t-i} + \sum_{i=1}^{r} \tau_i \Delta POP_{t-i} + \sum_{i=1}^{r} \delta_i \Delta FDI_{t-i} + \sum_{i=1}^{r} \gamma_i \Delta PC_{t-i} \\ & + \sum_{i=1}^{r} \Omega_i \Delta HCI_{t-i} + \sum_{i=1}^{r} \in_i \Delta INN_{t-i} + \mu_t \end{aligned} \quad (6)$$

$$\begin{aligned} \Delta GDP_t = {} & a_0 + \beta_0 GDP_{t-i} + \beta_1 LP_{t-i} + \beta_2 FDI_{t-i} + \beta_3 POP_{t-i} + \beta_4 PC_{t-i} + \beta_5 HCI_{t-i} + \beta_6 INN_{t-i} + \beta_7 \left(EX_t * LP_t \right) \\ & + \sum_{i=1}^{r} \varphi_i \Delta GDP_{t-i} + \sum_{i=1}^{r} \pi_i \Delta LP_{t-i} + \sum_{i=1}^{r} \pi_i \Delta FDI_{t-i} + \sum_{i=1}^{r} \tau_i \Delta POP_{t-i} + \sum_{i=1}^{r} \delta_i \Delta PC_{t-i} \\ & + \sum_{i=1}^{r} \gamma_i \Delta HCI_{t-i} + \sum_{i=1}^{r} \Omega_i \Delta INN_{t-i} + \sum_{i=1}^{r} \in_i \Delta \left(EX_t * LP_t \right)_{t-i} + \mu_t \end{aligned} \quad (7)$$

After the estimation of long-run coefficients, short-run coefficients are estimated using the error correction models as presented below. Where the coefficient of $ECT_{(t-i)}$ the term shows the speed of adjustment for long-run equilibrium from the shock in the short-run. The negative and significant signs of θ verify the continuity of the long-term relationship.

$$\Delta GDP_t = \sum_{i=1}^{r} \varphi_i \Delta GDP_{t-i} + \sum_{i=1}^{r} \pi_i \Delta EX_{t-i} + \sum_{i=1}^{r} \tau_i \Delta POP_{t-i} + \sum_{i=1}^{r} \in_i \Delta PC_{t-i} + \sum_{i=1}^{r} \gamma_i \Delta HCI_{t-i} + \sum_{i=1}^{r} \gamma_i \Delta HCI_{t-i} + \sum_{i=1}^{r} \Omega_i \Delta INN_{t-i} + \theta ECT_{t-i} + \mu_t \quad (8)$$

$$\Delta GDP_t = \sum_{i=1}^{r} \varphi_i \Delta GDP_{t-i} + \sum_{i=1}^{r} \pi_i \Delta LP_{t-i} + \sum_{i=1}^{r} \tau_i \Delta POP_{t-i} + \sum_{i=1}^{r} \delta_i \Delta FDI_{t-i} + \sum_{i=1}^{r} \in_i \Delta PC_{t-i} + \sum_{i=1}^{r} \gamma_i \Delta HCI_{t-i} + \sum_{i=1}^{r} \Omega_i \Delta INN_{t-i} + \theta ECT_{t-i} + \mu_t \quad (9)$$

$$\Delta GDP_t = \sum_{i=1}^{r} \varphi_i \Delta GDP_{t-i} + \sum_{i=1}^{r} \pi_i \Delta LP_{t-i} + \sum_{i=1}^{r} \tau_i \Delta POP_{t-i} + \sum_{i=1}^{r} \delta_i \Delta FDI_{t-i} + \sum_{i=1}^{r} \in_i \Delta PC_{t-i} + \sum_{i=1}^{r} \in_i \Delta HCI_{t-i} + \sum_{i=1}^{r} \gamma_i \Delta INN_{t-i} + \sum_{i=1}^{r} \Omega_i \Delta \left(EX_t * LP_t \right)_{t-i} + \theta ECT_{t-i} + \mu_t \quad (10)$$

Econometric method

Time-series analytical techniques are used to test the moderating effect of labour productivity on the relationship between RMG export and the economic growth of Bangladesh. The first step is to test the root of the unit using the Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979), Phillip Perron (PP) test (Phillips and Perron, 1988). This test was performed on the level and first difference. The null hypothesis under the ADF is used to test whether the variables have a unit root or not. These two hypotheses are written as:

H_0: $\gamma = 0$ (null hypothesis)

H_1: $\gamma < 0$ (alternative hypothesis)

The second step is used for co-integration. To test if the variables have a long-run relationship, the F-test is performed. The test involves computing and analysing the coefficients for the one-period lagged variables. A General to specific procedure is used to arrive at the final ARDL specification and used for further analysis (Katrakilidis & Trachanas, 2012). Thus the following hypothesis test will be performed:

$H_o : \beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$ (there is no co-integration among variables)

$H_1 : \beta_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$ (there is co-integration among variables)

The bound testing approach considered asymptotic values for bound I(0) and I(1). The upper and lower limit values for the I(1) and I (0) series are presented in Narayan (2005). Compared to the top bound is the resulting value of F- calculated. The null hypothesis is rejected if it is greater than the top bound value and guarantees the long-term relationship. If the F-statistic falls below the lower critical value the null hypothesis cannot be rejected. In addition, different diagnostic tests for the confidence and validity of the model are also conducted. In addition, the cumulative sum of residual waste and the cumulative sum of residual squares (CUSUMQ) tests are used to check the stability of the model.

Estimation of Long-Run Coefficients

After passing through all the diagnostic tests long-run coefficients is calculated by:

$$a_1 = \frac{\beta_1}{\beta_0}, a_2 = \frac{\beta_2}{\beta_0}, a_3 = \frac{\beta_3}{\beta_0}, a_4 = \frac{\beta_4}{\beta_0}, a_5 = \frac{\beta_5}{\beta_0}, a_6 = \frac{\beta_6}{\beta_0}, a_7 = \frac{\beta_7}{\beta_0}$$

To examine the moderating effect of labour productivity (EX_t*LP_t), we introduced the interaction estimation following the demean method by Balli and Sørensen (2013). The interaction regression in the form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 \left(X_1 - \overline{X}_1\right)\left(X_2 - \overline{X}_2\right) + \in \tag{11}$$

The above equation shows the demeaned interaction terms obtaining the mean of *X* then minus for each observation. To test the effect of a unit increase of labour productivity (*LP*) and it can be obtained as:

$$\frac{\partial GDP_t}{\partial lnEx_t} = a_1 + a_9 lnLp_t$$

Where α_1 is the direct or unconditional marginal effect of LP and it is constant across the period. α_9 *gives* the effect of LP on RMG export on growth. Since LP variable this means that their effects are not constant across the period. To explore the effect of LP on the relationship between RMG export and growth. The coefficient of RMG export on growth is expected to be positive and significant. A positive sign of α_9 is also expected on the relationship of RMG export and growth. However, the effect of LP can be different based on the quality of labour.

DATA SOURCES

A yearly time-series data of Bangladesh for the period 1983 to 2019 is used. Real GDP per Capita as a measure of economic growth is the dependent variable taken from the World Development Indicators. RMG exports (EX) and labour productivity (LP) (Khatun and Afroze, 2016) are the main independent variables. The data relating to RMG exports are obtained from one of the largest trade associations called Bangladesh Garment Manufacturers and Exporters Association (BGMEA) in Bangladesh. Empirical research indicates an important technique to isolate the impact of the independent variable on a dependent variable through the use of control variables in a model (Miyan & Biplob, 2019). The other widely used control variables for economic growth including population growth (Tumwebaze and Ijjo, 2015); physical capital (Çakmak & Gümüş, 2005); human Capital Index (Maitra, 2018); innovation (Tang and Tan, 2013). Various data sources are included in the series. Each series with a corresponding data source are reported in Table 1.

Table 1. Summary of Variable

Variables	Sources
GDP_t: Real Gross domestic product per capita (constant 2010 US$)	World Bank
EX_t: Readymade garment export (current US$)	Bangladesh Garment Manufacturer and Exporter Association (BGMEA)
LP_t: Growth of Labour Productivity per hour worked, percent change	The Conference Board Total Economy Database
FDI_t: Foreign direct investment, net inflows (% of GDP)	World Bank
PC_t: Gross capital formation (% of GDP)	World Bank
POP_t: Population growth (annual %)	World Bank
HCI_t: human capital index based on years of schooling and returns to education	Penn World Table
INN_t: Total patent application	WIPO (World Intellectual property organization)

RESULTS

Descriptive results

The descriptive statistics are shown in Table 2 which reveals the nature of every variable employed in the research. For all the variables required to determine the impact, the minimum and maximum values together with the average and standard deviation are provided in raw form. Readymade garment export (EX) has the highest variation in all the series. Table 3, indicates the correlation between variables. Among variables that have more interdependence, ARDL methodology can reduce the multicollinearity issue up to a huge extent. Besides, the inclusion of variables is not in one single model. Furthermore, to estimate the impact of readymade garment export and productivity on economic growth, the variables are employed in model 1a and model 1b respectively. Secondly, Model 1c is representing the interaction variables. To estimate the interaction effect which comprises the impact of the interaction of productivity and export and the interaction of export on economic growth.

Table 2. Descriptive Statistics

	GDP_t	EX_t	LP_t	HCI_t	FDI_t	PC_t	POP_t	INN_t
Mean	635.33	9828.25	3.42	1.68	0.51	22.95	1.79	245.08
Median	541.29	4859.83	3.25	1.66	0.38	24.17	1.88	293.00
Maximum	1287.82	34133.27	8.88	2.10	1.73	31.57	2.63	413.00
Minimum	378.09	31.57	-1.07	1.34	-0.02	15.47	1.04	93.00
Std. Dev.	258.00	10644.79	2.45	0.22	0.53	5.20	0.58	96.57

Note: *Number of observations: 37. The figures represent the raw data.*

Table 3. Pair-Wise Correlation

	GDP_t	EX_t	LP_t	HCI_t	FDI_t	PC_t	POP_t	INN_t
GDP_t	1							
EX_t	0.8826	1						
LP_t	0.5893	0.4823	1					
FDI_t	0.7893	0.8818	0.4656	1				
HCI_t	0.9822	0.9481	0.5761	0.8585	1			
PC_t	0.9250	0.9299	0.5897	0.9117	0.9674	1		
POP_t	-0.955	-0.9015	-0.5805	-0.8501	-0.9705	-0.9337	1	
INN_t	0.7982	0.8144	0.5998	0.8370	0.8549	0.92113	-0.8425	1

Note: *Correlation analysis of the variables shown represents their natural logarithmic values.*

Unit root test results

The order of integration needs to be identified before the ARDL model is executed. For example, the Augmented Dickey-fuller (ADF) and Phillips-Perron (PP) unit root tests are used to check the fixed number of the data, and their findings are provided in Table 4. All variables are stationary at either level or the first difference which implies mixed I(0) and I(1) for all variables. ARDL can get precise and consistent findings in ideal conditions because of the stationary results (Sulaiman and Abdul Rahim, 2018).

Table 4. Results of ADF and PP Unit Root Tests

VARIABLES		AUGMENTED DICKEY FULLER TEST (ADF)			PHILLIPS PERRON TEST (PP)		ORDER OF INTEGRATION
		Level	1st Difference		Level	1st Difference	
GDP_t	Constant	1.9127 (0.9997)	-4.4210 (0.0012)***	I(1)	2.3599 (0.9999)	-4.4858 (0.0010)***	I(1)
	Trend	-0.2286 (0.9897)	-4.3864 (0.0072)***		0.0681 (0.9957)	-5.0644 (0.0012)***	
EX_t	Constant	-5.6516 (0.001)***	-4.3616 (0.0016)***	I(0)	-5.611 (0.0001)***	-7.5683 (0.0001)***	I(0)
	Trend	-5.6931 (0.0002)***	-10.3727 (0.0001)***		-6.1203 0.0001)***	-9.9205 (0.0001)***	
LP_t	Constant	-2.6462 (0.0943)*	-6.8503 (0.0001)***	I(1)	-2.3735 (0.1567)	-7.3759 (0.0001)***	I(1)
	Trend	-2.8758 (0.1827)	-4.9958 (0.0037)***		-2.3463 (0.3991)	-10.7995 (0.0001)***	
FDI_t	Constant	-3.0699 (0.0406)**	-5.5623 (0.0001)***	I(1)	-1.1188 (0.6965)	-7.8504 (0.0001)***	I(1)
	Trend	-0.0012 (0.9941)	-6.1883 (0.0001)***		-2.9018 (0.1749)	-8.7704 (0.0001)***	
PC_t	Constant	-1.0769 (0.7135)	-4.1796 (0.0024)***	I(1)	-0.0240 (0.9501)	-4.1045 (0.0029)***	I(1)
	Trend	-1.9300 (0.6177)	-3.4009 (0.0680)*		-2.1797 (0.4860)	-4.0162 (0.0173)**	
HCI_t	Constant	1.8253 (0.9996)	-2.7988 (0.0687)*	I(1)	2.5580 (1.0000)	-2.6587 (0.0914)*	I(1)
	Trend	-1.4439 (0.8296)	-3.6982 (0.0362)**		-0.9130 (0.9434)	-2.9066 (0.1728)	
POP_t	Constant	-1.6736 (0.0346)**	-1.2626 (0.6345)	I(0)	-4.6843 0.0006)***	-0.5203 (0.8753)	I(0)
	Trend	-3.9466 (0.0232)**	-1.9277 (0.6170)		0.5480 (0.0991)**	-2.3031 (0.4214)	
INN_t	Constant	-0.4062 0.8970	-7.2617 0.0001***	I(1)	-0.6688 (0.8420)	-7.6382 (0.0001)***	I(1)
	Trend	-2.3612 0.3911	-7.1618 0.0001***		-3.2275 (0.0952)*	-8.1209 (0.0001)***	

Note: ****, ** and * denote significant at 1%, 5% and 10% levels, respectively. Figures in parentheses are p-values.*

Table 5 shows the results of ARDL bounds co-integration between dependent and independent variables. The F-statistics for all models are strongly alternative hypotheses and rejected the null hypothesis. This is because the calculated F-statistics is greater than the critical value of the upper bound I (1) at 1%, 5%, or 10% significance level. Therefore, it can be concluded that the null hypothesis of no co-integration can be rejected. The F-statistics value shows the existence of long-run co-integration between dependent and independent variables. F-statistics for all models is consistently greater than the critical value of the upper bound I (1) at a 5% significance level. Therefore, it is concluded that the null hypothesis of no co-integration can be rejected.

Table 6 shows the diagnostic tests that confirm the validity of the current study's all models. All heteroscedasticity, serial correlation, and normality testing were carried out in the estimated models. The CUSUM and CUSUMSQ tests for the estimated models have been used to determine the stability of the models, indicating that the parameters for the models are stable during the sample period since the CUSUM/CUSUMSQ figure is within the critical limits of the confidence interval of 5% for the parameter stability.

Table 5. Results of ARDL Bound Tests

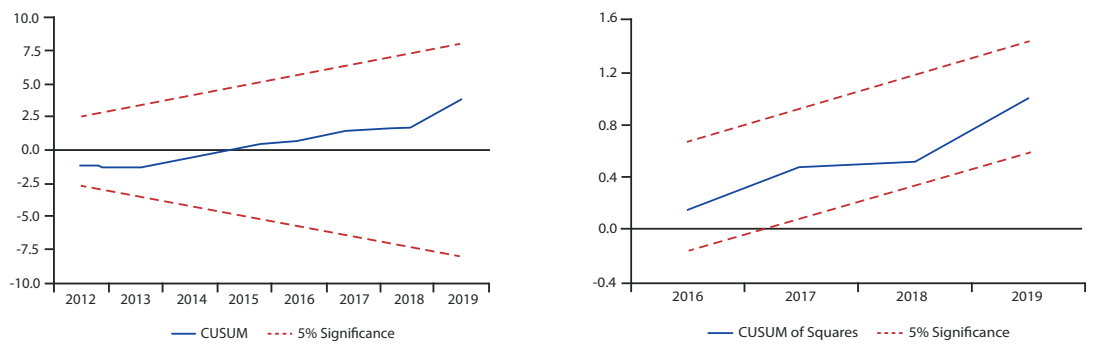
	Lower bound I(0)	Upper bound I(1)	Significance Levels (%)
Model 1a			
F= 6.168025	2.33	3.25	10
K=6	2.63	3.62	5
	3.27	4.39	1
Model 1b			
F= 4.886144	2.21	3.23	10
K=5	2.45	3.61	5
	3.15	4.43	1
Model 1c			
F=12.44810	2.12	3.23	10
K=6	2.45	3.61	5
	3.15	4.43	1

Note: *k is the number of regressors. The model selection method is the Alkaike info criteria (AIC).*

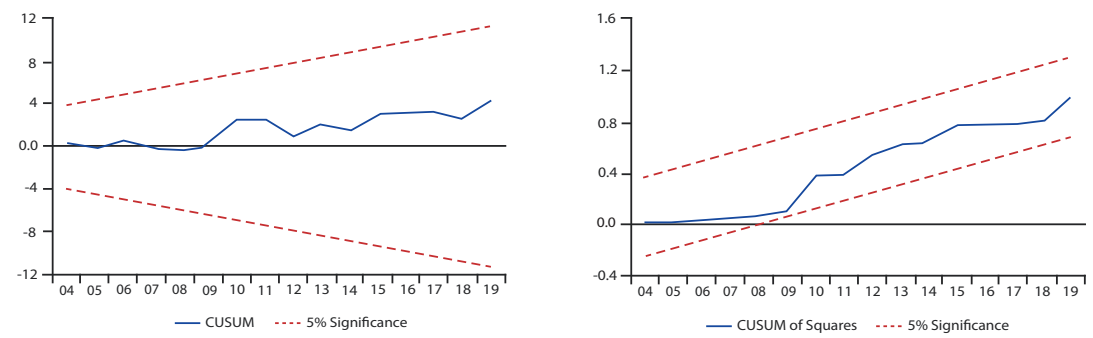
Table 6. Diagnostic Checks

	Model 1a	Model 1b	Model 1c
Normality (Jarque-Bera)	2.87 (0.23)	0.35 (0.83)	1.62 (0.44)
Serial Correlation (LM)	5.46 (0.15)	1.32 (0.28)	0.13 (0.63)
Heteroscedasticity (BPG)	0.66 (0.76)	1.40 (0.24)	1.37 (0.25)
Stability Test			
CUSUM (5% sig.)	Stable	Stable	Stable
CUSUM Sq (5% sig.)	Stable	Stable	Stable

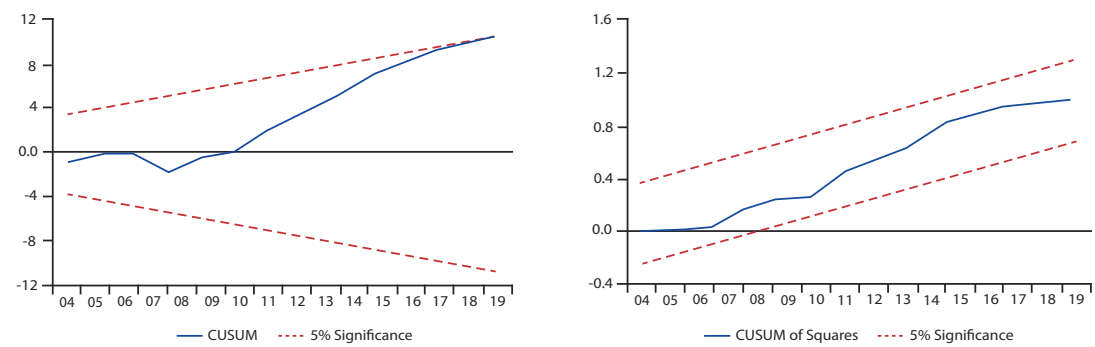
Note: *figures in parenthesis show p-values*



Model 1a



Model 1b



Model 1c

Long-run results

Once the co-integration existence among the variables was confirmed, the models were estimated for the long-term coefficients in Table 7. Model 1a shows that the anticipated long-term model demonstrates the positive and significant impact of 5% of RMG exports (EX) on economic growth. A 1% growth in exports of RMG (EX) in model 1a is increasing economic growth by 0.13%. This means that increased GDP revenues from RMG exports improve GDP growth. The higher the export income of the RMG sector, then, the longer the economy will continue to grow. This finding is consistent with Islam *et al.* (2016) and Islam (2020). Both studies found that growth in RMG exports contributes to the GDP of Bangladesh.

Table 7. Long Run Estimates

Variables	Model 1a	Model 1b	Model 1c
LEX	0.1398** (0.0026)	0.1132 (0.6169)	0.1701*** (0.0146)
LLP	-	0.0729 (0.2504)	0.0213 (0.1332)
LFDI	-	-0.0657 (0.3826)	0.0080 (0.7483)
LPOP	0.0858 (0.6121)	0.5450 (0.0000)	1.0321 (0.0629)
LPC	2.5930** (0.0443)	-0.19323 (0.4387)	-1.4779 (0.0360)
LHCI	3.4973** (0.0250)	5.5160** (0.0000)	8.0379** (0.0023)
LINN	0.4237** (0.0961)	0.0940** (0.0474)	0.1853** (0.0945)
L(EXT*LP)	-	-	0.1827** (0.0584)
CONSTANT	8.7998** (0.0391)	3.1136** (0.0060)	1.6490 (0.1502)

Note: ****, ** and * denote significant at 1%, 5% and 10% levels, respectively. Figures in parentheses are p-values.*

Thus, mixed results between population and economic growth are found in the literature. Our result is consistent with Tumwebaze and Ijjo (2015) who found that population growth has a positive impact on economic growth in India. The GDP will increase by 3.49% for every 1% increase in human capital, according to another coefficient of human capital (HC) that is statistically significant at 5% and favourably correlated with economic growth. These findings are consistent with the previous studies done by Ali et al (2018) and Maitra (2018), who also discovered that Bangladesh's economic growth is boosted by the development of its human capital. In terms of physical capital (PC), a 1% increase in this variable will increase the real GDP per capita by 2.59%. It means more investment in physical capital will formulate more economic growth in the long run for Bangladesh. Physical capital formation will

help the country to expand its productive capacity. The result is consistent with the study Akmak & Gümüş (2014), the findings of which show that physical capital has a large and advantageous impact on economic growth. Another control variable innovation (INN) is also found positive and significant at level 10% level to the economic growth of Bangladesh in a long-run relationship. The result shows 1% increase in technological innovation will boost economic growth by 0.423%. The finding is similar to previous time-series studies done by Tang and Tan (2013) and Sohag *et al.* (2015) for Malaysia; Liu and Xia (2018) for China. These studies discovered that innovation boosts a nation's economic development.

The second model (Table 7, model 1b) includes the impact of labour productivity (LP) on the economic growth (RGDP) of Bangladesh by incorporating other control variables in the previous section. The labour productivity growth shows a positive but not significant relationship at a 5% level with the economic growth of Bangladesh. The results show an increase in labour productivity will increase the GDP per capita by 0.03% but the change is not as it is expected. This result is consistent with the previous result by Korkmar and Korkmaz (2017) where they found a positive relationship between labour productivity and economic growth. Khatun and Afroze (2016) investigated the relationship between labour productivity and real GDP for five Asian countries including Bangladesh. In their results, they mentioned increase in Bangladesh's labour productivity increases the real GDP significantly. The coefficient of RMG export becomes insignificant in model 1b when we introduced the labour productivity in the regression model. This indicates that in the future the low level of labour productivity can be a reason for lowering the RMG exports. Although the result of labour productivity is according to theory, the Bangladesh government needs to engage in technological innovations and increase the workers' efficiency to achieve sustainable economic growth.

The next step of our empirical analysis is to determine which factors could "interact" with readymade garment export to significantly influence the economic growth of Bangladesh. Therefore, we have taken labour productivity (LP) as an interactive variable in model 1c. Firstly, Table 7 model 1c shows the result of the interactive effect between readymade garment export (EX) performance and labour productivity growth on the economic growth of Bangladesh. From model 1c, the EX variable is also found positive by 0.1701% at a 1% significant level. Although, the coefficient of EX in model 1c is larger than that of model 1a and model 1b. In model 1c, it is observed that the result of the RMG export and labour productivity interaction (EX*LP) coefficient is 0.1827, which is positive and significant at a 5% level. This result is in line with previous studies by Chowdhury *et al.*, (2017) and Dhiman and Sharma (2019). Both studies concluded that improving labor productivity is crucial for the success of RMG exports. This coefficient is positive and statistically significant over the long term with respect to the interaction term. The fact that this coefficient is substantially greater than the separate coefficients for RMG exports (EX) and labor productivity (LP) is crucial. This result is anticipated since it is in line with theoretical predictions and shows the potential for RMG exports (EX) and labor productivity (LP) to work in concert to boost economic development. Therefore, the link between RMG export and labour productivity is important to grow the overall economic growth. The implication of this result is that the economic growth effect of RMG exports is increased through improved labour productivity. The conclusion is that increased labor productivity is needed to increase the output of the RMG industry and increase competitiveness in the international markets. The other control variables such as human capital (HC), innovation (INNO), and physical capital (PC) are found similar to model 1a except for population growth (POP).

The other control variables human capital and population growth contribute to the long-term economic growth of Bangladesh. Investment in innovation throughout the RMG manufacturing chain offers advantages in cost reduction as well as the efficiency of speed to an international market, which will create the opportunity for manufacturers to repeat orders. Furthermore, the coefficient of FDI is found positive and insignificant in model 1c. This confirms the notion that foreign direct investments in the country are responsible for advancing technology and strengthening management skills, which directly affect workforce productivity. These findings validate the previous study of Korkmaz & Korkmaz (2017), which showed the results that foreign direct investment boosts labour productivity. As a result, the economic growth of the country will increase in long run. However, the insignificant result indicates that Bangladesh needs to gain more FDI for the long-term sustainability of the RMG industry.

Short-run result

Table 8 reveals the Error Correction Representation outcomes of the chosen ARDL models. The short-run values for each model are shown in the results. In model 1a, the coefficient of readymade garment export D(EX) negative effect on the economic growth of Bangladesh in the short run-up to lag 1, but it becomes positive and significant at level 5% at 2nd lag. The influx of D(FDI) has a considerable negative impact on short-term economic growth, while this is consistent with the long-run outcome (Table 7, model 1a). This result is not as predicted due to massive capital outflows to their home countries by foreign subsidiary companies operating in Bangladesh.

Table 8. Short-Run estimation

	Model 1a	**Model 1b**	**Model 1c**
D(EX)	-0.0067 (0.1080)	0.0081 (0.1777)	0.0321 (0.0051)
D(EX (-1))	0.0779** (0.0000)	0.0539** (0.0001)	-
D (LP)	-	-1.9984 (0.2474)	0.0020 (0.1623)
D(LP(-1))	-	0.0045** (0.0011)	-
D(FDI)	0.0080** (0.0000)	0.0029** (0.0022)	0.0053** (0.0102)
D(FDI(-1))	-0.0108 (0.0000)	-0.0061 (0.0002)	-
D(POP)	-0.0833 (0.1441)	-0.3024 (0.0001)	0.1918** (0.0270)
D(POP(-1))	0.0908 (0.3685)	0.2636 (0.0005)	-
D(PC)	0.0087 (0.8604)	0.0581** (0.0867)	-0.0427 (0.5987)
D(PC(-1))	0.4304 (0.0000)	0.0719 (0.0185)	-

D(INNO)	-0.04093 (0.1342)	-0.0023 (0.4871)	0.0420 (0.0007)
D(INNO(-1))	0.0946 (0.0006)	1.7970 (0.1101)	-
D(HC)	0.4014 (0.5774)	-2.8940 (0.0146)	4.8422** (0.0294)
D(HC(-1))	0.9136 (0.1185)	0.3312 (0.7467)	-
D(EX*LPG)	-	-	0.0077** (0.0016)
ECM_{t-1} (-1)	-0.0560** (0.000)	-0.0137** (0.000)	-0.1850** (0.000)
R-squared	0.9946	0.9893	0.9672
Adjusted R-squared	0.9885	0.9795	0.9481

Note: ****, **, * denote Significant at the 1%, 5% and 10% levels (**) respectively, Figures in parentheses*

Population growth D(POP) has a negative influence on economic growth in the short-run in level, but the result becomes positive at 1st lag. The impact of physical capital D(PC) is positive in model 1a but with a small magnitude as compared to its long-run estimates for model 1a. The impact of innovation D(INN) on economic growth is negative as shown in Table 8 for model 1b. After taking lag 1 the impact of innovation on economic growth come out positive and significant at a 5% level with a coefficient of 0.094 percent. The D(HC) is positively associated with economic growth in the short run. With a negative value of 0.05 percent, the error correction term is appropriately signed and significant, validating earlier findings regarding the long-term link between the variables. It implies that the dependent variable will reach equilibrium at a rapid rate. It ECM_{t-1} is 0.056 indicating that adjustments are corrected by 5.6% from the short-run to long-run of the period over every year.

Short-run results for Model 1b are reported in Table 8. The coefficient of D(Ex) is positive but insignificant but after 1st lag, the coefficient becomes positive and significant by 0.0539 percent. The immediate impact of labour productivity D(LP) is significant and negative but after taking one lag the coefficient comes out positive and significant. It signifies that increasing the labour productivity of the labour force takes time to adopt new technology and innovations and improve skills it takes a longer period. The coefficient of population growth D(POP) in the short run is negative and significant with a coefficient of 0.3024 percent. However, with one lag difference, the coefficient of D(POP) turns into a significant positive with 0.26 percent. It means a 1% increase in population growth will help to increase economic growth by 0.26%. The ECM_{t-1} term has a negative value of 0.01375 and is correctly signed. It predicts that the dependent variable will adapt to equilibrium at a high rate of 1.3%.

In model 1c (Table 8) the short-run interactive effect between RMG export (EX) and labour productivity (LP) on economic growth (GDP) was found positive and significant at a 5% level with a value of 0.0077 but with a smaller magnitude compared to its long-run estimates in Table 7, model 1c. This result is equally consistent with the long-run result. It can be validated as RMG exports have an interactive effect on labour productivity in promoting the economic growth of Bangladesh. The foreign direct investment D(FD) coefficient is positive and significant with 0.19% which signifies a

one percent increase in foreign capital investment lead to a 0.19% increase in GDP in the short run. It proves FDI inflows are the key indicator for the economic growth of Bangladesh. With a negative value of 0.18 percent, the ECM_{t-1} term is correctly signed and significant, validating past findings regarding the long-term relationship between the variables in model 1c.

For all models in Table 8, all ECM_{t-1} terms are appropriately signed, significant, and have a negative percent value to support earlier findings about the long-term relationship between the variables.

All R2 values of models 1a, 1b, and 1c reflect the percentage of the dependent variable is explained by the independent variables. In addition, all models are robust and well-fitted, as shown in all statistical results (R2, adjusted R2).

CONCLUSION

The impact of the readymade garment industry on economic growth is found to be a significant factor in this study which proved that the readymade garment industry contributes to the development of Bangladesh positively. This result also explains the lack of RMG industry-specific skills contributed to the low labour productivity in the long run because unskilled labour does not boost economic growth. Low labour productivity is one of the major challenges of the readymade garment industry. To improve labour productivity within the sector it is necessary to facilitate labour in developing the quality of skilled labour by creating an environment of proper education and training. By recognizing the significance of indicators to economic growth as well as the efficiency with which expenses support public sector output, studies like the ones conducted here can offer solutions to improve the content and productivity of the expenditure. Similarly, it should be emphasized that economic growth is not equally supported by all public investments.

It is important to ensure that garment factories implement productivity in line with their wage policies to increase labour productivity. Moreover, companies need to ensure work reforms that motivate the workforce to attain the desired productivity level. The workforce development input can be captured by a robust performance management system within garment companies. In addition, necessary training and development must be built on the basis that individual employees need to receive development inputs. For building a skilled labour force with better education an enhancement of education spending is needed. It is also suggested that a global integration will allow room for more digitalization and will enable labours to use technology extensively in the operation of the garment industry. Since women make up the majority of the workforce for ready-made clothing, better working conditions, the maintenance of adequate safety and health measures, and protection from physical and psychological harassment are necessary for increasing labour productivity.

The rights and welfare of workers working in RMG entrepreneurs should also be ensured. The managers must also ensure a strong performance management system for textile companies, which incorporates workforce development input. In addition, training and development requirements developments collected for each individual employee. This can be an improvement metric in labour productivity. Future studies can include women labour force indicator and their impact on readymade garment export performance. Future research should analyze ready-made clothing companies' perceptions of export restrictions at the firm level throughout all manufacturing sectors.

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OGRANIČEN UTICAJ PRODUKTIVNOSTI NA IZVOZ GOTOVE KONFEKCIJE I EKONOMSKI RAST U BANGLADEŠU

Rezime:

Ova studija istražuje moderirajuću ulogu produktivnosti rada na odnos između gotovog izvoza i ekonomskog rasta u Bangladešu koristeći godišnje podatke u periodu od 1983. do 2019. koristeći ARDL metod. Ova studija ispituje smanjenje uticaja produktivnosti rada na vezu između izvoza gotove odeće (RMG) i ekonomskog rasta u Bangladešu uzimajući podatke u periodu od 1983. do 2019. koristeći ARDL model. Najvažniji faktor koji utiče na konkurentnost industrije RMG-a u Bangladešu su loši trendovi produktivnosti rada. Uočen je dugoročan pozitivan odnos između izvoza RMG-a, produktivnosti rada i ekonomskog rasta. Zarada od izvoza RMG-a značajno poboljšava ekonomski rast zemlje kako na duži, tako i na kratak rok. Implikacije poslovne politike su poboljšanje radnih veština, obezbeđivanje obuke, a upotreba informacionih tehnologija u sektoru RMG će promovisati ekonomski rast.

Ključne reči:

produktivnost rada,
ekonomski rast,
izvoz konfekcije,
ARDL,
Bangladeš.

JEL klasifikacija:
J38, J097, F16.