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THE FINANCIAL DEVELOPMENT-ENVIRONMENTAL DEGRADATION NEXUS IN BANGLADESH: A LONG-RUN CO-INTEGRATION APPROACH

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ABSTRACT

Using annual time series data from 1983 to 2019, this study examines the impact of economic growth, exports, energy consumption, and financial development on environmental deterioration in Bangladesh. The long-run cointegration of variables is investigated using Dynamic Ordinary Least Squares (DOLS) and Fully Modified OLS (FMOLS) approaches. The co-integration study demonstrates a long-term relationship between dependent variable and independent variables. The findings reveal that in the long run the primary determinants of carbon dioxide emissions are economic growth, energy consumption, export, and financial development are the primary determinants of carbon dioxide emissions. Except for energy consumption, the result shows that financial development, economic development, and export have a statistically significant long-run co-integration with environmental degradation (CO_2 emissions and ecological footprint). The Environmental Kuznets Curve, a quadratic term for economic expansion, demonstrates a negative impact on environmental degradation (EKC). The key findings show and emphasize the need for sound policies for more equal economic and financial growth, as well as, environmentally sustainable financial services. According to the findings, the government should prioritize programs that reduce carbon dioxide emissions by strengthening the financial sectors. Also government should consider the role it plays in slowing environmental degradation and hence, directly enhancing environmental quality in Bangladesh.

Contribution/ Originality: This study contributes to the existing works of literature by adding evidence that financial development is responsible for environmental degradation. The study is one of the few studies in the Bangladesh context that examine the effect of financial development on environment quality using both CO_2 emission and ecological footprint measures.

1. INTRODUCTION

Global warming is currently one of the most critical concerns affecting industrialized, emerging, and developing countries. As a result of the effects of degrading the environment's quality, The depletion of ozone layer has been proven in the literature as a term that refers to carbon dioxide (CO_2) emissions as the primary contributor to global warming (Alam, Begum, Buysse, & Van Huylenbroeck, 2012). Since the 1900s, global greenhouse gas (GHG) emissions from fossil fuels have grown dramatically. CO_2 emissions are known for their influence on environmental deterioration as many different forms of pollution. Several factors have been linked to CO_2 emissions, including a country's income level, financial development, use of renewable energy, and technical innovation, human capital, and gross domestic product (GDP). Several recent studies have found a link between

financial development, energy use, and pollution in diverse locales and countries. Tang and Tan (2014) and Islam, Shahbaz, Ahmed, and Alam (2013) in Malaysia, Zhang (2011) in China, and Coban and Topcu (2013) in the European Union have all shown direct links between energy use and pollution (EU).

This implies that economic growth and energy use exacerbate environmental deterioration. Other research, notably (Tamazian & Rao, 2010) across transition nations, Shahbaz, Khan, and Tahir (2013) in Indonesia, and Jalil and Feridun (2011) in China, showed the opposite conclusion, namely that financial growth improves environmental quality by reducing carbon dioxide emissions. As a result, Previous research has connected them to both economic development and foreign direct investment (Costantini & Monni, 2008; Inglesi-Lotz & Dogan, 2018; Zhang, Peng, Ma, & Shen, 2017).

Bangladesh, a small South Asian country, has become one of Asia's best performers over the previous decade, with an average annual economic growth rate of more than 6%. It is a developing country with a large population and good demographics, with promising future progress in the economy. As a result of the constant economic growth, the electricity demand has been rising at an alarming rate in the last few years. Considering the environmental degradation is a worldwide issue, it is critical to examine the factual links between FD and environmental degradation from the standpoint of individual countries. The graph below Figure 1 shows that when financial development increases, CO2 emissions grow as well.

The objective of this article is to look at the impact of exports, GDP per capita, financial development, and energy consumption on CO2 emissions in Bangladesh using the Environmental Kuznets Curve (EKC) paradigm. This study, which uses ecological footprint as a measure of the environment, gives a better knowledge of environmental deterioration. Several studies examine the relationship between FD, energy, development, and emissions to produce better policy solutions for managing both development and the environment at the same time (Majeed, Samreen, Tauqir, & Mazhar, 2020). These studies provide diverse policy suggestions for different nations and locations based on inconclusive results. These studies have a fundamental flaw in that they use CO2 emissions as a measure of environmental damage (Bekhet, Matar, & Yasmin, 2017; Maji, Habibullah, & Saari, 2017; Zakaria & Bibi, 2019). However, carbon emissions are only one aspect of the environmental damage produced by large-scale energy usage (Al-Mulali & Sheau-Ting, 2014).

The advantage of using EFP, on the other hand, is that it combines environmental data into a single measure that can be easily compared to the related productive capacity, emphasizing how much of the ecosystem surface we use for survival. The demand for natural resources is growing as the world's population grows. As a result, securing the long-term use of natural resources has turned into a worldwide concern. As a result, knowing the degree of natural resource usage is critical in order to protect them for future generations. Many studies consider the EFP to be a more complete and trustworthy indication of environmental impact (Al-Mulali & Sheau-Ting, 2014; Uddin, Salahuddin, Alam, & Gow, 2017). For the following reasons, this research recommends EFP as a comprehensive measure of environmental deterioration.

The implication of this study if financial institutions give loans and concessions to industries that embrace green technology and promote environmentally friendly initiatives, the overall environmental impact can be reduced. The contribution of this study is it will provide a valuable insight understanding of FD as a potential predictor of environmental degradation including its both measures CO2 emission and ecological footprint. Thus, this study will also contribute to the FD-environment nexus literature. Also, no previous research on these factors in Bangladesh, thus the current study informs academia and policymakers about the current state of dynamic linkages among exports, financial development, energy consumption, economic growth, and environmental quality in Bangladesh. The remainder of the study is structured as follows: the following The review of related literature is presented in Section 2. The data, methods, and statistical analysis are discussed in Section 3. Section 4 presents the empirical findings as well as their interpretation. Section 5 shows the conclusion and makes policy suggestions.
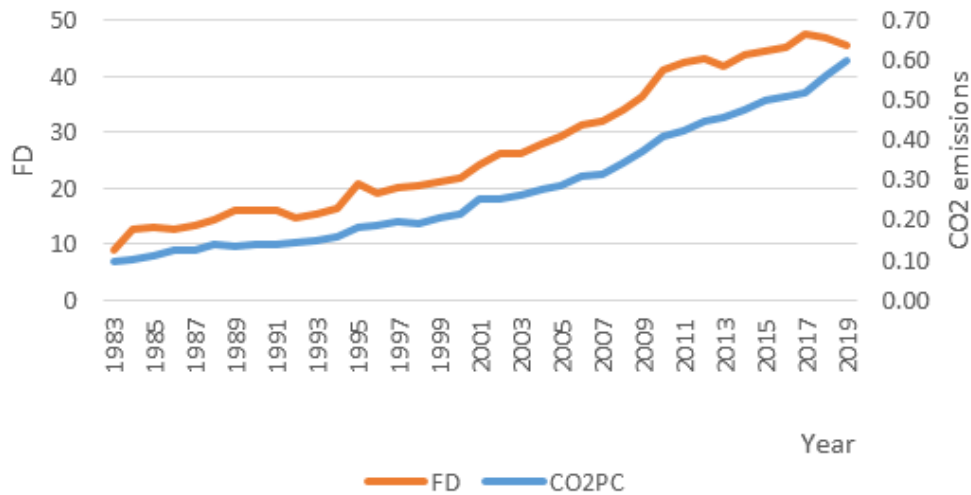
Figure-1. Financial development and CO2 emission of Bangladesh.

2. REVIEW OF RELATED LITERATURE

Environmental degradation is the result of a variety of human actions that have resulted in a decline in environmental quality due to natural resource depletion, species expansion, weather fluctuations, and ecosystem loss (Majeed & Mazhar, 2019). Environmental deterioration has become a major focus of academic research in recent decades. As a result, both environmental ideas and empirical evidence have received a lot of attention and controversy. Environmental Kuznets Curve (EKC) theory provides the theoretical underpinning for this paper. According to EKC, environmental degradation rises in the early stages of economic growth, but at a certain degree of economic growth, society begins to ameliorate its connection with the environment. Grossman and Krueger (1995) were the first to observe the inverted U-shaped relationship between environmental pollutants and per capita income and introduced the name EKC. The empirical evidence strongly supports the existence of EKC in both developed and developing countries (Grossman & Krueger, 1995). The pioneering research on the financial development and environment nexus was began by Aufderheide and Rich (1988). They said that the World Bank's financial aid system frequently overlooks the environmental consequences of loanable taxes, resulting in major environmental issues. Furthermore, several research that used time-series data came to the same result. For example, Moghadam and Dehbashi (2018) observed negative consequences of financial development in Iran, Sehrawat, Giri, and Mohapatra (2015) in India, Mesagan and Nwachukwu (2018) in Nigeria, and Raza and Shah (2018) in Pakistan.

The influence of financial development (FD) on environmental deterioration has been noted in the literature (Destek & Sarkodie, 2019; Katircioglu & Katircioglu, 2018; Sarkodie & Strezov, 2019; Zhang, 2011; Zhang & Zhang, 2018). Zhang (2011) emphasized the importance of a well-developed institution in mitigating environmental stress (ecological footprint). Through research and development, financial development promotes environmental quality by attracting and bringing more environmentally friendly ideas to market. It may also make it easier to invest in renewable energies. Investment in renewable energy, example, is increasing, which is more environmentally friendly and helps to lessen the ecological impact (EFP). FD, on the other hand, can boost economic efficiency by minimizing capital risk and financial costs. In addition, through extending FDI inflows, stock market operations, and banking operations, FD may boost R&D and investment in clean technologies. FD, on the other hand, contributes to environmental damage by encouraging and enabling the use of credit to buy mechanical machinery, electrical equipment, vehicles, and residences. These facilities assist investors in broadening their company scopes and establishing new machinery and factories, which increases carbon emissions in the environment and deteriorates environmental quality (Zhang & Zhang, 2018).

Furthermore, as a result of a well-developed financial system, an increase in foreign direct investment adds to environmental damage (Sarkodie & Strezov, 2019). Based on the ARDL methodology Using quarterly data, Ali et al. (2019) explore the effects of financial development on energy usage in Nigeria between 1972Q1 and 2011Q4 According to the findings, as the null hypothesis is, variables are cointegrated. At the 1% threshold of significance, the hypothesis was rejected. The long-term outcome demonstrates that the financial impact is significant. The trend in energy usage is downwards, and while economic development has a detrimental impact, it is minimal even though it has a major influence on energy usage and energy prices have been positive and considerable for quite some time usage of energy. Farhani and Ozturk (2015) investigate taking data from 1971-2012the causal linkage between CO2 emissions, real GDP, energy consumption, financial development, trade openness, and urbanisation in Tunisia. They also used the distributed lag (ARDL) bounds testing methodology to assess the cointegration and error correction methods (ECM). The key empirical conclusion is that the variable of financial development has a positive and significant influence on pollution levels. This suggests that Tunisia's financial industry is growing at the expense of the country's environmental degradation. Salahuddin, Alam, Ozturk, and Sohag (2018) employed Kuwait data from 1980 to 2013 to use an autoregressive distributed lag (ARDL) bounds testing methodology. The purpose is to investigate how economic development, energy consumption, FDI, and financial development impact environmental quality. According to the core research findings, economic development, electricity consumption, and foreign direct investment all raise carbon dioxide emissions in the short and long term.

The mixed results of previous studies on this topic are the motivation to investigate this issue in the context of Bangladesh. In both the short and long periods, Alam et al. (2012) and Ghosh, Alam, and Osmani (2014) found evidence of one-way causation running from energy use to financial development and energy consumption to CO2 emissions. Uddin and Wadud (2014) analyzed seven SAARC nations and discovered that the variables of CO2 emissions and economic growth had a co-integration connection. CO2 emissions have a long-term favorable and considerable influence on economic growth. According to Alam et al. (2012), in the short run, unidirectional causation occurs between energy consumption and economic growth, however, in the long run, bidirectional causation exists between electricity consumption and economic growth. Nonetheless, Alom, Uddin, and Islam (2017) identified a causal association between energy consumption and CO2 emissions, CO2 emissions, and economic development in the short run, but no long-term cointegrating association in Bangladesh. According to the research of Bangladesh utilizing data from 1985 to 2013, bidirectional causation exists between the variables of financial development, power consumption, and fossil fuel energy consumption with economic growth in the short term. Therefore, financial progress is strongly linked to environmental quality, and vice versa. The greater the amount of energy consumed, the greater the chance of more carbon emissions will lead to a worsening of the situation increased pollution, and, as a result, a reduction in environmental quality.

3. EMPIRICAL MODEL AND METHODOLOGY

Since the study has used two different measures (CO2 and Ecological footprint) of environment degradation. These two measures are run by separate models. Equation 1 is for CO2 emissions model and Equation 2 is for the ecological footprint model. The log-linear regression model to gain the objective of this study is follows:

$$LnCO2_t = \alpha_0 + \alpha_1 LnEX_t + \alpha_2 LnGDP_t + \alpha_3 LnGDP_t^2 + \alpha_4 LnFD_t + \alpha_5 LnEU_t + \mu_t \qquad (1)$$

$$LnEFP_t = \alpha_0 + \alpha_1 LnEX_t + \alpha_2 LnGDP_t + \alpha_3 LnGDP_t^2 + \alpha_4 LnFD_t + \alpha_5 LnEU_t + \mu_t \qquad (2)$$

Firstly, this study has done the Unit root tests to check the unit root property of the variables by employing test Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to know the stationary quality of the variables. the ADF and PP test was carried out based on the following model:

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$$\Delta X_t = \alpha_0 + \gamma X_{t-1} + \beta_t + \sum_{i=1}^{k} \beta_i \, \Delta X_{t-1} + \epsilon_t$$

Here, Δ represents the difference operator, t portrays the time trend, ε denotes the error expression termed as a white noise error, signifies the series and k shows the number of lags used.

The Akaike Information Criterion (AIC) or the Schwarz Bayesian Criterion can be used to determine the optimal lag duration (SBC). The obtained F-statistic is compared to the critical limits established by Pesaran, Shin, and Smith (2001) or Narayan (2005) the upper critical bound and lower critical bound in the first phase of the bounds testing methodology. Several diagnostic tests, such as autocorrelation, functional form, normality of error term, and heteroskedasticity, can be used to assess the model's robustness. Brown, Durbin, and Evans (1975) proposed the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMsq) tests to assess the parameters' stability.

This study used the fully modified OLS (FMOLS) and dynamic OLS estimators to further assess the robustness of the aforesaid ARDL models (DOLS). The literature has proposed several long-term estimated coefficient models, including Fully Modified OLS (FMOLS) and Dynamic OLS (DOLS). Long-term carbon emissions, economic growth, energy consumption, financial developments, and export in FMOLS and DOLS models are all included in the study.

The FMOLS model coefficient estimates are consistent with relatively small samples and also control the endogenous problem among retro-generators. Based on the theoretical framework of study Altıntaş and Kassouri (2020) and Nathaniel (2020) who used FMOL and DOLS taking the same variables in their analysis, this study following the FMOLS estimator is shown in Equation 3:

$$\beta_i^* = \left(X_i' X_i\right)^{-1}\left(X_i' y_i^*\right) - T\delta)$$

(3)

The dynamic OLS (DOLS), which means that the co-integrating regression is increased by lags and leads. The following equation is used to obtain the Dynamic OLS model is shown in Equation 4:

$$Y_{it} = \alpha_i + X_{it}'\beta + \sum_{j=-q_1}^{j-q_2} C_{ij}\Delta X_{it+j} + v_{it'}$$

(4)

In the above-mentioned equation X indicates all the independent variables i.e. EX, GDP, FD, EU, and OP. Cij indicates the coefficients for the lead or lag of first differenced independent variables. Hence, the estimated coefficients using DOLS is given in Equation 5:

$$\hat{\beta}_{DOLS} = \sum_{i=1}^{N}(\sum_{t=1}^{T} Z_{it}Z_{it}')^{-1}\left(\sum_{t=1}^{T} Z_{ij}\hat{y}_{it}^+\right)$$

(5)

Where $z_{it} = [X_{it} - \hat{X}_i, \Delta X_{i,t-q} \ldots \ldots \Delta X_{i,t+q}]$ is a vector of repressors, and $\hat{y}_{it}^+ (\hat{y}_{it}^+ = y_{it} - \hat{y}_{i)}$ is the carbon emission variable.

3.1. Data

The sample period starts in 1983 and ends in 2019. The time-series data has been included. The variables names and their sources are shown in Table 1. The ecological footprint data is taken from Global Footprint

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Network. The remaining data such as CO2 emission, exports, GDP, energy consumption, and financial development are obtained from World Bank World Development Indicators. All the variables are transferred into a natural logarithm.

Table-1. Variables, measurements and data sources.

Variables	Measurement	Source
Carbon dioxide emissions (CO2)	Carbon emission (metric tons per capita (kt)	World Development Indicators
Ecological footprint (EFP)	Ecological footprint per capita (hectares (gha))	Global Footprint Network
Export (EX)	Total merchandise export in USD	World Development Indicators
Gross domestic product per capita (GDP)	Gross domestic product per capita (current US$)	World Development Indicators
Financial development (FD)	Domestic credit to the private sector (% of GDP)	World Development Indicators
Energy consumption (EU)	Fossil fuels consumption (% of total energy)	World Development Indicators

Source: WDI (2020).

Table 2 shows the descriptive statistics of the variables those are incorporated in the current study. The statistics show that the minimum value of ecological footprint is 0.066 while the maximum value for export is 9828.257.

Table 3 shows the correlation between dependent variable along with other explanatory variables. All variables are positively correlated with each other.

Table-2. Descriptive statistic.

Description	CO2	EFP	EX	GDP	EU	FD
Mean	0.278	0.491	9828.257	635.330	162.012	27.046
Median	0.250	0.466	4859.830	541.291	153.560	24.179
Maximum	0.600	0.603	34133.27	1287.822	229.246	47.583
Minimum	0.095	0.409	31.570	378.092	107.672	9.034
Std. Dev.	0.149	0.066	10644.79	258.009	42.959	12.340
Observations	37	37	37	37	37	37

Table-3. Pair-wise correlations.

Variable	LNCO2	LNEFP	LNEX	LNGDP	LNEU	LNFD
LNCO2	1					
LNEFP	0.9100	1				
LNEX	0.9470	0.7653	1			
LNGDP	0.9789	0.9455	0.8893	1		
LNEU	0.9924	0.9260	0.9306	0.9765	1	
LNFD	0.9914	0.8821	0.9629	0.9527	0.9857	1

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

4. ESTIMATION RESULTS

4.1. Unit Root Test

To determine the order of integration, it is important to estimate the unit-roots test using Augmented Dickey Fuller (ADF) and Phillips Perron (PP) for all variables. The results of the ADF and PP are shown in Table 4. To fulfil the requirement all variables must be stationary either at level I(0) or first difference I(1) to apply the long-run cointegration methods (Pesaran et al., 2001). All the variables are stationary at first difference which means all variables are I(1).

Table-4. ADF and PP unit root tests.

Variables	Models	Augmented Dickey Fuller Test (ADF)		Phillips Perron Test (PP)		Order of Integration
		Level	1st Difference	Level	1st Difference	
LCO2	Constant	3.8407	-4.1592	7.1920	-4.0956	I(1)
	Trend	(1.0000)	(0.0025)***	(1.0000)	(0.0030)***	
		-0.0596	-6.0575	1.3037	-7.8937	
		(0.9937)	(0.0001)***	(0.9999)	(0.0001)***	
LEFP	Constant	1.0775	-4.7468	0.8214	-4.8275	I(1)
	Trend	(0.9965)	(0.0006)***	(0.9929)	(0.0005)***	
		-1.3894	-5.4666	-1.3895	-5.4650	
		(0.8455)	(0.0005)***	(0.8454)	(0.0005)***	
LEX	Constant	1.8562	-3.7456	0.6259	-5.5069	I(1)
	Trend	(0.9996)	(0.0090)***	(0.9885)	(0.0001)***	
		-4.2223	-4.0362	-1.6420	-5.9240	
		0.0126)**	(0.0195)**	(0.7558)	(0.0001)***	
LGDP	Constant	11.7070	-0.9385	10.6692	-0.4172	I(1)
	Trend	(1.0000)	(0.7638)	(1.0000)	(0.8953)	
		5.4086	-2.6394	4.8174	-2.5012	
		(1.0000)	(0.0002)***	(1.0000)	(0.0012)***	
LEU	Constant	0.3113	-2.7478	0.1861	-5.8045	I(1)
	Trend	(0.9757)	(0.0766)*	(0.9679)	(0.0001)***	
		-1.8256	-2.6126	-1.9450	-5.7763	
		(0.6713)	(0.2774)	(0.6105)	(0.0002)***	
LFD	Constant	-1.9497	-7.7154	-2.1787	-13.4098	I(1)
	Trend	(0.3068)	(0.0001)***	(0.2171)	(0.0001)***	
		-3.9104	-7.5865	-3.9104	-14.2603	
		0.0218)**	(0.0001)***	0.0218)**	(0.0001)***	

Note: The ADF and PP test equations include both constant and trend terms. The Schwarz information criterion (SIC) is used to select the optimal lag order in the ADF test equation. The values in brackets are corresponding p values. *, **, ***Significance level at 1, 5, and 10% respectively.

The cointegration test results are reported in Table 5. The calculated F-statistics must be larger than the upper bound critical values. The F-statistics for the CO2 emission model is 8.101 and for the ecological model, the F statistics is 4.886.

Table-5. Results of ARDL bounds test.

Dependent variable: Carbon emission model			
Model 1: (LCO2= LEX, LGDP, LGDP2, LEU, LFD)			
	Lower bound I (0)	Upper bound I (1)	Significance levels (%)
	2.08	3	10
F= 8.101	2.39	3.38	5
K=5	3.06	4.15	1
Dependent variable: Ecological footprint Model			
Model 2: (LEFP= LEX, LGDP, LGDP2, LEU, LFD)			
	2.49	3.38	10
F= 4.886	2.81	3.76	5
K=5	3.5	4.63	1

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

Before the estimation, all models need to pass several diagnostic tests as given in Table 6. Brown et al. (1975) developed the cumulative sum of the residual square test residual square (CUSUMQ) to assess the model's median stability and variance. When two straight lines are represented as critical value lines, the CUSUM track decreases below 5%, indicating that the coefficients are stable. A comparable metric was used in the CUSUMQ test. The CUSUM and CUSUMQ tests' graphs. As a result, the coefficients can be determined to be stable. Tests of serial correlation and normality. The models pass the tests since their p-values are greater than 0.05, indicating that the null hypothesis that there is no serial correlation or normalcy issue is not rejected. Their residuals are serially uncorrelated and normally distributed, according to them. The Jarque-Bera test, the Lanrange Multiplier test for

residual serial correlation, and the CUSUM and CUSUM square tests are all shown in Figure 2 and Figure 3 separately in each model to show the stability test outcomes.

Table-6. Diagnostic check.

	Model 1	Model 2
Normality (Jarque-Bera)	0.46 (0.79)	0.34 (0.84)
Serial Correlation LM	1.53 (0.23)	1.04 (0.59)
Heteroscedasticity (BPG)	5.01 (0.75)	3.7 (0.80)
Stability Test		
CUSUM (5% sig.)	Stable	Stable
CUSUM Sq (5% sig.)	Stable	Stable

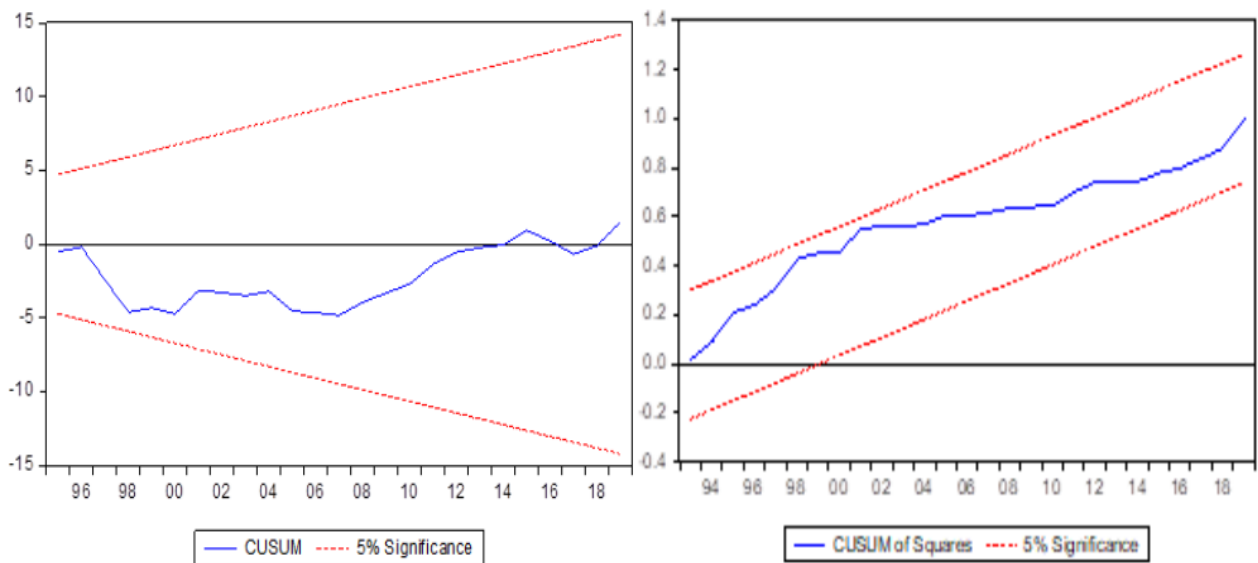**Note:** figures in parenthesis show p-values.

Figure-2. Stability test of CUSUM & CUSUM of Squares for CO2 emission model.
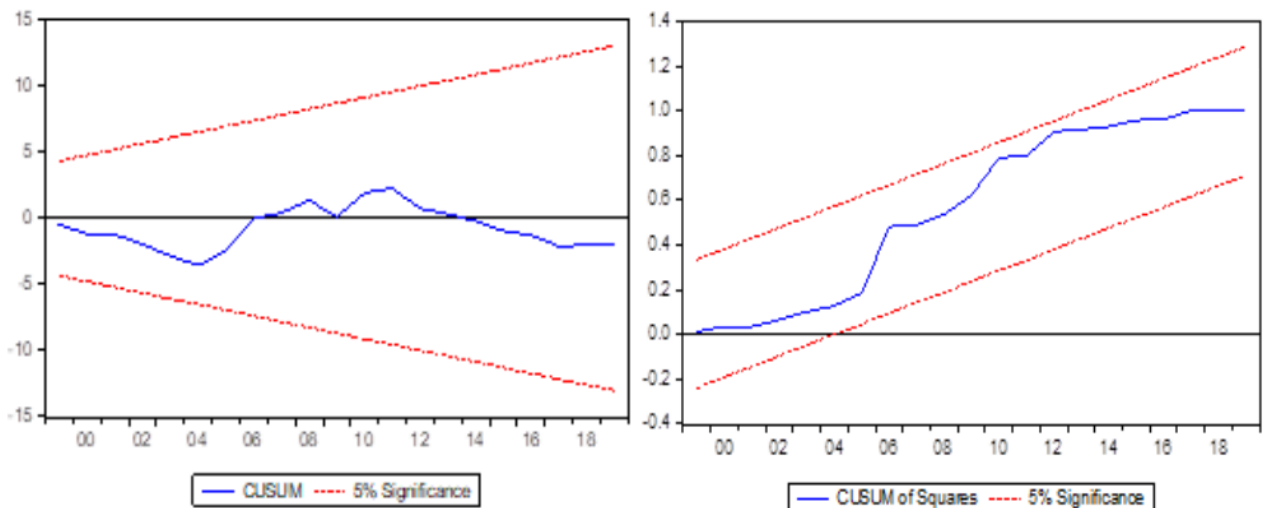
Figure-3. Stability test of CUSUM & CUSUM of Squares for Ecological footprint model.

4.2. Results of FMOLS and DOLS Estimations

For confirming the long-run effects of the variables on CO2 and EFP as reported in Tables 7 and 8, the current study applied two robustness checks (DOLS and FMOLS). The application of dynamic OLS results which were different from those obtained by fully modified OLS. Table 7 shows the result for the dependent variable CO2 and

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Table 8 shows the result for the dependent variable LEFP. Table 7 the export is turned out to be a major factor causing CO_2 emission means a 1% increase in export will cause 0.0409% in FMOLS and 0.0133% in DOLS estimations. The coefficients of LRGDP and LRGDP² for both FMOLS and DOLS results in it can be concluded that the EKC hypothesis is valid for model 1a, a similar result was found in the previous result. The energy consumption (LEU) was surprisingly found negative and not significant in both FMOLS and DOLS with values of .1646% and .3147%. The coefficients of financial development (LFD) are showing positive and significant at a 1% level with values of 0.4786% and 0.574% in FMOLS and DOLS respectively. This means with the improvement of FD in the country will reduce the environmental quality. This result is consistent with recent research by Al-mulali and Sheau-Ting (2014), which demonstrated that financial development decreases environmental quality in European nations. When a result, as more carbon emissions are produced, financial progress is linked to severe environmental effects.

Table-7. Estimation results by FMOLS & DOLS (Dependent variable CO2).

Variables	FMOLS	DOLS
LEX	0.0409** (0.0138)	0.0133** (0.4437)
LGDP	4.0141 (0.0492)	7.8593 (0.0005)
LGDP²	−0.2474 (0.0858)	−0.5363 (0.0019)
LEU	−0.1648 (0.5409)	−0.3147 0.1791
LFD	0.4786** (0.0019)	0.5749** (0.0001)

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

Table 8 shows the results for the ecological model. In terms of LRGDP and LRGDP² results for model 2, FMOLS is not significant whereas DOLS is significant to mean increasing economic growth will help to reduce the ecological footprint. Whereas, in DOLS model shows that economic growth will reduce the environmental quality of Bangladesh.

Table-8. Estimation results by FMOLS & DOLS (Dependent variable EFP).

Variables	FMOLS	DOLS
LEX	−0.0745*** (0.0001)	0.2018 (0.1142)
LGDP	0.7857 (0.6930)	8.6794** (0.0730)
LGDP²	−0.0435 (0.7584)	-7.7172** (0.0743)
LEU	0.4419 (0.1101)	0.2588 (0.7438)
LFD	0.0926 (0.5173)	-5.9594** (0.0786)

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

However, the DOLS result is consistent with previous studies such as Ozokcu and Ozdemir (2017); Pal and Mitra (2017) reported that there is no significant evidence of EKC. This implied that the continued economic growth in Bangladesh shall be expected to harmful for the environmental improvements. The energy consumption (LEU) shows a positive coefficient in FMOLS and DOLS respectively. As the export performance and economic performance increase it the consumption of energy will also rise. This is the situation in Bangladesh. In order to abate the devastating impact of coal consumption results in a higher ecological impact. Charfeddine and Mrabet (2017) have examined energy consumption degrades environmental quality by increasing ecological footprint by

applying FMOLS and DOLS. Interesting and conflicting results have been achieved with the financial development (LFD) of the capital market. Contrasting results were found for the increase in CO2 emissions on the capital market. The FMOLS estimates in particular have a good impact but the DOLS estimates have shown a significant negative impact of FD on the degradation of the environment.

5. CONCLUSION & POLICY IMPLICATIONS

This paper has examined the long-run co-integration among financial development, export, energy consumption, GDP, and CO2 emissions in the case of Bangladesh throughout 1983-2019 by employing FMOLS and DOLS methods. In addition, an inverted U-shaped link between per capita real income and per capita carbon emissions was discovered, confirming the validity of the EKC hypothesis in the Bangladesh economy over the longer term. This signifies that the per capita income is at high-level Carbon emissions rise in tandem with per capita real GDP at first. When it reaches a certain point, then a rise Carbon emissions are reduced when per capita real income rises. However, in the ecological footprint measure, there is no presence of EKC hypothesis. Since economic growth has a negative impact on the environment, it appears important to call for an increase in energy efficiency in manufacturing technologies if long-term economic development is desired. In this regard, the regulator should ensure that investment projects have minimal environmental effects by approving the most socially and ecologically responsible investments that employ cleaner industrial technology.

The financial development variables show a negative impact on the environment in both models whereas the energy consumption has a positive impact on the environment when used CO2 emission measure whereas the result turns into opposite when the ecological footprint measure is taken. The findings of this study have policy implications for Bangladesh. To begin with, environmentally conscious essential industries can benefit from trade subsidies pollution-intensive industries can be taxed in the most efficient way possible. The financial sector may give a variety of lending facilities to the real sector that wishes to embrace cleaner and more environmentally friendly technology, therefore supporting these investments. Thus, it may be claimed that the Bangladeshi government should maintain sensitivity to both environmental and economic goals. As a result, Bangladesh's policymakers should think more about environmentally-friendly technology in order to emit less carbon and raise awareness about the issue. Nonetheless, policymakers in Bangladesh must carefully balance their connection and place a premium on emission reduction, since rapid expansion would obstruct long-term economic development while substantially increasing the cost of living. In the future, the expense of pollution management will be higher. Governments, in particular, could find it legitimate to mobilize greater financial resources for industrial upgrading, which might boost productivity and reduce energy use and, ultimately, economic growth as well as a reduction in carbon emissions in long run. As a result, the authorities may consider prioritizing the growth of the stock market, which performs better in terms of limiting carbon emissions than the expansion of financial institutions. Overall, by prohibiting the import of energy-inefficient devices, offering subsidies on low-carbon technology, and imposing or raising taxes on fossil fuel consumption, the government may improve the quality of life of households and meet the well-being goals. Future studies may use the findings and methods of this study to gain a better understanding of the finance–environmental nexus in other developing nations.

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