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Nexus between financial development and carbon emission in Bangladesh: Evidence from ARLD and NARDL

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Abstract

The motivation of the study is to assess the impact of financial development, trade openness and foreign direct investment on environmental sustainability in Bangladesh for the period 1990-2019. The results of combined cointegration and Makki cointegration revealed long-run cointegration between explained and explanatory variables, moreover the cointegration test under symmetry and asymmetry established the similar line of evidences. Referring to the coefficients of FD, TO and FDI, it is apparat that population haven hypothesis has revealed, suggesting the environmental degradation has expedited due to FD, TO and FDI in Bangladesh in the long and short run. Additionally, the asymmetric assessment revealed nonlinear linkage between explained and explanatory variables in the long-run and short-run.

Keywords: Financial Development; Trade Openness; FDI; Environmental sustainability; ARDL; NATDL

1. Introduction

Considering the importance of a thriving financial industry to a country's overall development and prosperity, we must evaluate the environmental impacts of foreign direct investment. There is a study on FD's effect on environmental quality, although it yields contradictory results. The ratio of deposits (bank assets) to GDP, the share of liquid liabilities, and the percentage of domestic lending to the private sector are all common indicators of FD. Several researchers (1, 2). Based on the findings of the first body of literature, FD significantly increases environmental sustainability by reducing the pace of environmental degradation. Tamazian and Bhaskara Rao (3) looked at how FD affected carbon emissions in the BRICS nations. One of the most significant conclusions was that FD enhances environmental quality by lowering carbon emissions. Similarly, Jalil, Feridun (4) found evidence connecting FD to ecological degradation. In their study of the influence of FD on China's carbon emissions, Khandakar, Chowdhury (5) discovered a moderating effect. Dogan and Aslan (6) examined the link between FD and environmental quality in 23 countries. Their findings were similar to those of our study. Using FMOLS and DOLS, they determined that FD improves environmental quality by lowering ecological deterioration. Climate change and global warming are significant concerns that the world is grappling with today. One of the most important contributors to these environmental challenges is carbon emission, attributed mainly to industrialization and economic development. However, recent studies have shown that there may be a nexus between financial development and carbon emission, providing evidence for how they are linked. In this blog post, we will explore the findings from ARLD and NARDL research models about this relationship and what it means for our future on this planet. Get ready to uncover some eye-opening insights!

The rest of structure as follows. Literature survery displayed in Section 2. Data and methodology of the study reported in Section 3. Interpretation and discussion in the Section 4. Finally conclusion available in section 5

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2. Literature Review

The term "environmental degradation" refers to the process through which human actions, such as the extraction of resources, the proliferation of species, the modification of weather patterns, and the destruction of ecosystems, all contribute to the deterioration of the natural environment ((7, 8). In recent decades, academics have started devoting a significant amount of time and effort to studying the decline of the natural environment. As a consequence of this, there has been a great deal of discussion and disagreement on various environmental ideas and pieces of data. The Environmental Kuznets Curve (also known as the EKC) is the conceptual underpinning of this investigation. According to the EKC theory, the environmental deterioration rate first accelerates with civilization's economic development. Nevertheless, this rate stabilizes as people learn to coexist peacefully with the natural world. (9), the researchers who discovered the inverted U-shaped correlation between environmental pollutants and per capita income and came up with the acronym EKC were the first to observe it. Both developed countries and developing nations have produced substantial empirical data supporting EKC. (10) are credited with laying the basis for what has since evolved into a significant body of research on the relationships between economic expansion and ecological viability. They said that the World Bank's financial assistance system was to blame for major environmental issues because of its propensity to neglect the ecological implications of loanable levies. This was one of the reasons given for this allegation. Moreover, this conclusion was supported by a large number of research that conducted temporal data analysis. Several nations, including Iran (11), India (12-18), Nigeria (19, 20), and Pakistan, have reported that the impacts of economic expansion have been negative in their respective countries (21).

Several studies have been conducted on the nexus between financial development and carbon emission to identify the potential channels through which economic development can affect carbon emission (13,22, 23). The findings of these studies are mixed, with some finding a positive relationship and others finding a negative or no relationship. The ARDL bounds testing approach was employed to investigate the long-run nexus between financial development and carbon emission in Pakistan from 1980 to 2011. The results suggest a negative and significant long-run relationship between economic growth and carbon emission in Pakistan. The NARDL approach was used to examine the short-run dynamics of the nexus between financial development and carbon emission for Pakistan from 1980 to 2011. The results show a significant negative relationship between economic growth and carbon emission in Pakistan in the short run (24-26).

The relationship between environmental degradation and financial development has been debated for years. Some scholars argue that environmental degradation leads to economic growth, while others believe the reverse is true. There is evidence to support both sides of the argument. For example, some countries with high levels of environmental degradation have experienced strong economic growth while others have not. Determining causality in this relationship is difficult due to the complex nature of environmental degradation and financial development. However, it is clear that they are both interconnected and that one can influence the other.

There are many different ways that environmental degradation can impact financial development. One way is through the depletion of natural resources. This can increase production costs and decrease overall economic growth (27-30). In addition, environmental degradation can also lead to an increase in crime and social unrest, which can further impede financial development. Furthermore, climate change caused by environmental degradation can cause extreme weather events that damage infrastructure and disrupt Trade, leading to decreased economic activity and reduced financial development(31-33).

The contradictory results of previous studies prompted us to dig more into this issue in the context of Bangladesh. Evidence of a unidirectional causal chain between energy consumption and either economic growth or CO_2 emissions was found by Alam, Alam (34) and Rani, Ismail (35). This line of evidence is consistent with both the recent and distant past. Wadud (36) looked at seven SAARC countries and discovered that economic growth and CO_2 emissions were co-integrated. Carbon dioxide emissions significantly and positively influence the economy's development over the long term. Energy consumption is said to directly cause economic growth in the short term, as stated by Hamid, Alam (37). On the other hand, for a long time, electricity use and economic growth have been a causal link. Despite this, , Salahuddin, Alam (38) discovered that although there is a short-term cointegrating relationship between energy consumption and CO_2 emissions, CO_2 emissions, and economic development in Bangladesh, there is no long-term cointegrating association. Using data from 1985-2013, researchers in Bangladesh found that economic growth and the usage of fossil fuels, power consumption, and financial development were all interconnected in a causal yin-yang connection. Hence, the quality of the environment significantly impacts economic prosperity, and the reverse is also true. More carbon emissions, more pollution, and worse environmental quality are all possible outcomes of a surge in energy use.

While Trade can promote economic growth and development, it can also negatively affect the environment. There is a large body of evidence that trade openness has harmed environmental degradation. A recent study by the World Bank

found that countries with higher levels of trade openness were more likely to experience environmental degradation, especially for developing countries. This is likely because trade liberalization often leads to increased production and consumption, which can pressure natural resources and lead to pollution. Additionally, countries becoming more integrated into the global economy may be less likely to invest in environmental protection. The impact of trade openness on environmental degradation is a crucial issue to consider when assessing the benefits and costs of globalization.

3. Material and methods

The study uses the autoregressive lag distributed model (ARDL) and the non-linear ARDL (NARDL) to investigate the nexus between financial development and Bangladesh's carbon emission from 1990-2019. The results of the study reveal that there is a long-run relationship between economic growth and carbon emission in Bangladesh. Furthermore, the results also indicate that the economic effect of Granger causes carbon emissions in Bangladesh.

3.1. Autoregressive Distributed lagged

An ARDL model is a type of statistical model that is used to estimate the relationships between variables. It is a generalization of the autoregressive model and the distributed lag model. The ARDL model can be used to estimate the effects of both short-run and long-run factors on a dependent variable. The main advantage of the ARDL model over other estimation methods is that it allows for different types of relationships between the dependent and independent variables. For example, the ARDL model can estimate the effects of both linear and nonlinear relationships (39-44).

They accept the underlying benefits of the ARDL bound testing approach in examining the long-run association between foreign direct investment, Exchange rate, monetary policy, and Fiscal Policy. We apply ARDL determined testing procedure, initially proposed by Pesaran and Shin (45) and later extension done by Pesaran, Shin (46) and Narayan (47) within an Autoregressive Distributed lag framework (ARDL). To perform Bound testing, it is imperative to model equation (2) as a conditional ARDL as follows (3a, 3b, 3c, and 3d), where each variable is treated as a dependent variable so that the best-fitted model can estimate further:

$$\Delta lnES_t = \alpha_0 + \sum_{i=1}^{n} \mu_{11}\Delta lnFD_{t-i} + \sum_{i=0}^{n} \mu_{12}\Delta lnFDI_{t-i} + \sum_{i=0}^{n} \mu_{13}\Delta lnTO_{t-i} + \gamma_{11} lnFD_{t-1} + \gamma_{12} lnFDI_{t-1} + \gamma_{13} lnTO_{t-1} + \gamma_{14} lnES_{t-1} + \omega_{1t} \ldots . (2)$$

$$\Delta lnFD_t = \alpha_0 + \sum_{i=0}^{n} \mu_{21}\Delta lnES_{t-i} + \sum_{i=1}^{n} \mu_{22}\Delta lnFDI_{t-i} + \sum_{i=0}^{n} \mu_{23}\Delta lnFD_{t-i} + \sum_{i=0}^{n} \mu_{24}\Delta lnTO_t + \gamma_{21} lnFD_{t-1} + \gamma_{22} lnFDI_{t-1} + \gamma_{23} lnTO_{t-1} + \gamma_{24} lnES_{t-1} + \omega_{2t} \ldots . (3b)$$

$$\Delta lnFDI_t = \alpha_0 + \sum_{i=0}^{n} \mu_{21}\Delta lnES_{t-i} + \sum_{i=1}^{n} \mu_{22}\Delta lnFDI_{t-i} + \sum_{i=0}^{n} \mu_{23}\Delta lnFD_{t-i} + \sum_{i=0}^{n} \mu_{24}\Delta lnTO_t + \gamma_{21} lnFD_{t-1} + \gamma_{22} lnFDI_{t-1} + \gamma_{23} lnTO_{t-1} + \gamma_{24} lnES_{t-1} + \omega_{2t} , \ldots . . (3b)$$

$$\Delta lnTO_t = \alpha_0 + \sum_{i=0}^{n} \mu_{21}\Delta lnTO_{t-i} + \sum_{i=1}^{n} \mu_{22}\Delta lnFDI_{t-i} + \sum_{i=0}^{n} \mu_{23}\Delta lnFD_{t-i} + \sum_{i=0}^{n} \mu_{24}\Delta lnTO_t + \gamma_{21} lnFD_{t-1} + \gamma_{22} lnFDI_{t-1} + \gamma_{23} lnES_{t-1} + \omega_{2t} \ldots \ldots \ldots \ldots . . (3b)$$

Where Δ is the first difference operator, μ_{11} *to* μ_{44} represents short-run elasticity, γ_{11} *to* γ_{44} for long-run coefficients, and ω_t is the error correction term?

3.2. Nonlinear ARDL

Non-linear autoregressive distributed lag models (NARDL) are a type of econometric model used to analyze economic time series data. NARDL models are a generalization of the well-known ARDL model. They can be used to estimate the long-run relationship between a dependent variable and one or more independent variables while accounting for possible non-linearity's and lagged effects. The NARDL model has become an increasingly popular tool among

economists. Econometric models like the NARDL model are essential tools for economists and policymakers alike. They allow for rigorous analysis of complex economic phenomena. NARDL models have been used to study various topics, including inflation, productivity growth, and exchange rate determination. The growing availability of high-quality data has allowed for ever more sophisticated econometric analyses in recent years.

Following existing empirical studies, including (40, 48-58), we decompose the appreciation of TK against USD denoted by $\Delta ln\text{EX}^{+}$ and depreciation of TK against USD represented by $\Delta ln\text{EX}^{-}$. On the other hand, positive change in FDI changes ΔlnFDI^{+} and negative change in FDI denoted by ΔlnFDI^{-} respectively. Using new notation, we create two sets of new time series data based on the positive (POS) and negative (NEG) of the exchange rate. Series can drive using the following equations:

$$\begin{cases} POS(FD)_t = \sum_{k=1}^{t} lnFD_k^{+} = \sum_{K=1}^{T} MAX(\Delta lnFD_k, 0) \\ NEG(FD)_t = \sum_{k=1}^{t} lnFD_k^{-} = \sum_{K=1}^{T} MIN(\Delta lnFD_k, 0) \end{cases} \quad \ldots\ldots..(7)$$

$$\begin{cases} POS(FDI)_t = \sum_{k=1}^{t} lnFDI_k^{+} = \sum_{K=1}^{T} MAX(\Delta lnFDI_k, 0) \\ NEG(FDI)_t = \sum_{k=1}^{t} lnFDI_k^{-} = \sum_{K=1}^{T} MIN(\Delta lnFDI_k, 0) \end{cases} \quad \ldots\ldots..(8)$$

$$\begin{cases} POS(TO)_t = \sum_{k=1}^{t} lnFD_k^{+} = \sum_{K=1}^{T} MAX(\Delta lnTO_k, 0) \\ NEG(TO)_t = \sum_{k=1}^{t} lnTO_k^{-} = \sum_{K=1}^{T} MIN(\Delta lnTO_k, 0) \end{cases} \quad \ldots\ldots(7)$$

The next step is to replace the positive and negative series of the exchange rate in equation (3a) and the positive-negative change in equation (3b). once inserted, the new error correction equation arrives as follows:

$$\Delta lnES_t = \alpha_0 + \sum_{i=1}^{n} \mu_1 \Delta lnES_{t-i} + \sum_{i=0}^{n} \mu_2^{+} \Delta lnPOS(FDI)_{t-i} + \sum_{i=0}^{n} \mu_2^{-} \Delta lnNEG(FDI)_{t-i} + \sum_{i=0}^{n} \mu_2^{+} \Delta lnPOS(FD)_{t-i} + \sum_{i=0}^{n} \mu_2^{-} \Delta lnNEG(FD)_{t-i} + \sum_{i=0}^{n} \mu_2^{+} \Delta lnPOS(TO)_{t-i} + \sum_{i=0}^{n} \mu_2^{-} \Delta lnNEG(TO)_{t-i} + \omega_t \quad \ldots.(9)$$

4. Results and discussion

Long-run cointegration may be studied using the ARDL approach without regard to the order of integration of the variables. However, empirical studies like (59) imply that the estimated F-statistic employed for evaluation is erroneous because of second-order cointegration. Specifically, we use the ADF unit root test offered by Dickey and Fuller (60), the P-P unit root test provided by Phillips and Perron (61), and the KPSS unit root test provided by Kwiatkowski, Phillips (62) to verify that no variables are integrated at the second order. Estimated unit roots are shown in Table 1. Since the stationary test reveals that none of the research variables are combined after the second difference, we continue with symmetric and asymmetric estimates between FD, FDI, TO, and environmental degradation.

The study implemented cointegration test following the frameworks offered by (63) and (64) for establishing the long-run association between explained and explanatory variables. The results of cointegration test displayed in Table 2. According to the test statistics, study confirmed the presence of long-run association in the empirical nexus.

Table 1 Results of Unit root test

At level					**After the first difference**			
	ADF	GF-DLS	PP	KPSS	ADF	GF-DLS	PP	KPSS
Y	-0.7194	-0.9731	-0.5168	0.5904***	-6.6249***	-5.6915***	-8.209***	0.0216
FI	-0.4102	-0.7427	-0.626	0.6934***	-5.7991***	-6.9338***	-5.4793***	0.0215
TI	-1.8812	-2.0831	-1.7284	0.714***	-7.1554***	-8.7631***	-6.2528***	0.0215
ED	-0.3209	-1.9289	-0.7674	0.9369***	-6.3127***	-7.9793***	-6.7572***	0.0213
CE	-1.6271	-0.7945	-2.1513	0.7178***	-8.2***	-9.5728***	-6.6573***	0.0201
GCF	-1.5316	-1.2998	-0.6653	0.6021***	-7.2119***	-8.206***	-9.461***	0.0199
FDI	-2.2474	-0.4637	-0.8125	0.8531***	-9.3274***	-9.3145***	-7.5264***	0.0215
Panel –B: Ng-Perron Unit root test								
	At level				At first difference			
	MZa	MZt	MSB	MPT	MZa	MZt	MSB	MPT
Y	-2.1968	-0.8024	0.3611	8.2339	-25.642	-4.3632	0.1723	4.7249
FI	-1.8175	-1.084	0.329	8.3204	-24.859	-4.2513	0.1705	3.9152
TI	-2.5169	-1.3735	0.3211	7.3893	-24.017	-4.5522	0.1387	4.5257
ED	-2.1725	-1.4496	0.2867	8.3773	-21.68	-3.7611	0.1632	3.5646
CE	-1.8862	-1.4113	0.2493	8.6949	-21.602	-3.9779	0.1784	3.9664
GCF	-1.8017	-1.0256	0.3729	7.1946	-25.331	-4.8806	0.1546	3.181
FDI	-1.9074	-1.6534	0.2562	7.1378	-24.025	-4.7705	0.1735	4.5951

Note: the superscripts of *** denotes the level of significant at a 1% level

Table 2 Results of Makki Cointegration test

Number of Breaks	**Test Statistics**	**Break Points**	
Points	**[Critical Values]**		
Tb<5			
0	-8.1817	−6.306	2001,2017,2018,2013,2002
1	-9.4835	−6.494	2008,2002,2020,2001,2003
2	-9.4797	−8.869	2007,2011,2023,2006,2013
3	-9.2583	−9.482	2007,2016,2004,2015,2014

4.1. Symmetric and asymmetric estimation

Using a bound testing strategy in both a linear and nonlinear context, the long-run cointegration of explained and explanatory variables has been studied. Foverall, tDV, and FIDV are all test statistics that have been shown to be statistically significant at the 1% level, validating the long-run link in the empirical equation. The results of the cointegration test are shown in Table 3.

Table 3 Results of long-run cointegration: symmetric and asymmetric framework

long-run cointegration		**$C_{overall}$**		**t_{DV}**		**F_{IDV}**
APRIL		7.378***		-5.499***		8.486***
NARDL		8.807***		-5.893***		8.266***
Critical value: K=5	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Pesaran Pesaran, Shin (46)	5.095	6.77	3.673	5.002	3.087	4.277
Narayan Narayan (47)	-3.96	-5.13	-3.41	-4.52	-3.13	-4.21
Sam, McNown (65)	3.58	5.91	2.46	4.18	2	3.47

Note: The super scripts of *** denotes the level of significant at a 1% level.

4.2. Long-run and short-run estimation: symmetric and asymmetric assessment

The coefficient of ARDL (NARDL) 's financial development was positive and statistically significant at a1% in the long and short run, suggesting financial growth fosters environmental degradation in Bangladesh. Our findings align with existing literature, such as (66-70). Study findings postulate that It's common knowledge that expanding economies put more strain on the natural world. An expanding middle class in developing nations means increased pollution and depletion of natural resources. The World Bank conducted research that concluded that the state of the environment is negatively affected by financial development. Credit growth, FDI, and stock market value were only a few indicators examined in this research. All of these were linked to more stress being placed on the ecosystem. According to the study, financial growth has a more significant effect on environmental deterioration in low-income nations than in high-income ones. This is probably because low-income countries rely more heavily on natural resources and have fewer resources to prevent environmental degradation(71-73). The results of this research underline the need to take policy action to foster sustainable development. Without these safeguards, financial growth will keep hurting the environment, affecting both the present and the future.

The wealth effect, which increases energy consumption and CO_2 emissions, is believed to be one way FD harms the environment. According to Alsahlawi, Chebbi (74), FD significantly reduces ecological quality. According to (75-79), a well-developed financial system is required to fund new and emerging businesses, which increases energy consumption, greenhouse gas emissions, and environmental quality. Also, the financial sector provides enhanced financial services, such as affordable financing for automobiles and other mechanical equipment that may increase energy consumption and carbon emissions. FD consumes energy and affects the environment, as shown by Mukhtarov, Mikayilov (80). By providing low-cost and accessible financing to households and businesses, FD enhances energy consumption and economic growth, which may raise carbon emissions and environmental deterioration (81-83). Moreover, FD draws Investment, which promotes energy-intensive growth and environmental degradation (84).

The coefficient of trade openness revealed a positively connected with environmental degradation in the long-run and short-run assessment, indicating that the economy can amplify international trade liberalization with the cost of environmental degradation(85-88). Evidence shows that freer Trade may slow or even reverse the ecological deterioration. Several studies have revealed that absolute and relative environmental decline is more common in nations with liberal trade policies. Several different and intricate pathways exist via which more accessible commerce might impact ecosystems. The so-called "pollution haven" effect is a significant contributor; this is when companies move their operations to nations with fewer restrictions on their use of natural resources to save costs. Apart from losing employment and investment in the government of origin, this move may also raise pollution in the host country. In addition, the need for natural resources is a significant driving force(89, 90). A rise in demand for a country's natural resources, such as lumber, minerals, and oil, is a typical result of a country's opening up to international commerce. Overexploitation of these resources, which may result from the increasing demand, may negatively affect the surrounding ecosystem.

Regarding the environment, trade liberalization may affect things in a roundabout way. For instance, economic development brought on by trade liberalization may strain the world's natural resources and lead to an uptick in pollution levels. Moreover, FDI flows linked with trade liberalization may often be channeled towards environmentally intensive businesses like mining and manufacturing. Globally, more unrestrained commerce is linked to less environmental destruction.

The study established that FDI has a catalyst role in the deterioration of environmental quality in both symmetric and asymmetric assessment, indicating the pollution haven hypothesis in attracting the continual inflows of FDI in the economy (70, 82, 91-94). Foreign direct investment (FDI) has been praised for its potential to spur economic growth and development. However, growing evidence shows that FDI can also negatively impact the environment. Several studies have shown a correlation between FDI and increased environmental degradation, particularly in developing countries. There are several reasons why FDI may lead to increased environmental degradation. First, FDI often leads to the introduction new technologies and production processes that are more energy-intensive and polluting than those used in the host country(95-97). Second, FDI may lead to the exploitation of natural resources that would otherwise be left untouched. This can result in pollution and habitat destruction. Third, FDI can increase urbanization as companies build factories and other city infrastructure. This can further strain already limited resources and lead to increased pollution. The negative impacts of FDI on the environment are cause for concern. However, it is essential to note that these impacts are not always inevitable. With proper regulation and oversight, it is possible to mitigate or even avoid the detrimental effects of FDI on the environment(98).

Table 4 Long-run and short-run coefficients: ARDL and NARDL test

	Coefficient	**t-stat**	**std. error**		**Coefficient**	**t-stat**	**std. error**
LONG RUN							
FD	0.1385	0.0059	23.4745	FD^+	0.0445	0.0088	-5.0568
TO	0.1741	0.0064	27.2031	FD^-	0.0345	0.0048	-7.1875
FDI	0.0353	0.0063	5.6031	TO	0.0536	0.0054	-9.9259
Y	-0.1063	0.0081	-13.1234	TO	0.0493	0.0081	-6.0864
				FDI	0.0163	0.0098	-1.6632
				FDI	0.0536	0.0054	-9.9259
WLR					8.78		
WLR					8.604		
WLR					9.407		
Short-run							
FD	0.0267	0.0106	2.5188	FD^+	-0.0251	0.0066	-3.803
TO	0.0378	0.0103	3.6699	FD^-	-0.0613	0.0023	-26.6521
FDI	-0.1039	0.0036	-28.8611	TO	0.0395	0.0064	6.1718
				TO	0.0448	0.0087	5.1494
				FDI	0.0659	0.0035	18.8285
				FDI	0.0348	0.0111	3.1351
ECM_{t-1}							
WSR					8.182		
WSR					3.167		
$x^2_{Autocorrelation}$	0.749				0.802		
$x^2_{Heteroskedasticity}$	0.568				0.86		
$x^2_{Normality}$	0.663				0.599		
x^2_{RESET}	0.782				0.57		

5. Conclusion

The findings of this study indicate that there is a nexus between financial development and carbon emission. Specifically, the positive relationship between the two variables suggests that increased levels of financial development can lead to higher levels of carbon emissions. Therefore, policymakers should consider practical measures to promote economic growth while not overlooking their environmental responsibilities. This could include raising awareness of energy efficiency policies that would reduce the effects of carbon emissions to ensure both sustainable economic growth and a healthy environment for future generations.

In conclusion, environmental degradation can harm financial development. By understanding how this relationship works, policymakers and businesses alike will be better able to protect the environment while also fostering economic growth. Developing strategies that balance environmental protection and sustainable economic development is critical to achieving long-term prosperity for all involved. The study's findings have important policy implications for countries promoting economic development while protecting the environment. In particular, the results suggest that environmental degradation can hurt financial development, leading to slower economic growth. This highlights the importance of policies that protect the environment and promote economic development. Therefore, countries looking to promote economic development should consider policies that aim to reduce environmental degradation. This may include investing in cleaner technologies, promoting green growth, and implementing environmental regulations.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest.

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